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OCCUPATIONAL RADIATION EXPOSURES IN CANADA - 1985

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ABSTRACT

This is the eighth in a series of annual reports on Occupational Radiation Exposures in Canada. The information is derived from the National Dose Registry of the Bureau of Radiation and Medical Devices, Department of National Health and Welfare. As in the past this report presents by occupation: average yearly whole body doses by region, dose distributions, and variations of the average doses with time. Statistical data concerning investigations of high exposures reported by the National Dosimetry Services are tabulated in summary form.

This document was prepared by Mr. J.A. Wilson, Dr. J.P. Ashmore, and Mr. D. Grogan of the Occupational Radiation Hazards Division, Bureau of Radiation and Medical Devices. Acknowledgements are extended to Mr. B. Davies and Mrs. M. Holder for their assistance.

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INTRODUCTION

This report provides statistics on occupational radiation exposures of monitored workers in Canada. The information is based upon the data in the National Dose Registry (NDR) maintained by the Bureau of Radiation and Medical Devices of the Department of National Health and Welfare[1]. The Registry is a centralized record-keeping system containing dose information on all monitored workers in Canada. It includes records from the National Dosimetry Services (NDS) as well as data submitted by nuclear power generating stations, Atomic Energy of Canada Ltd, and uranium mines. About 80 percent of the records are from the NDS with the remaining 20 percent being submitted to the NDR by other organizations.

Information for input into the NDR is received in a number of different physical forms. Data from the NDS are fed directly from the dosimeter reading stations into a computer, where they are processed, reported, and entered into the NDR files. Dose records are submitted to the Registry on magnetic tape or punched card; a few organizations submit their records on paper. The information is stored in the NDR in three physical forms: disk, tape and microfilm. Data which require continual use, such as current and cumulative dose information, are stored on disk, while those which require less frequent use are stored on magnetic tape. Historical records are stored on microfilm.

The types of statistics presented are similar to those in previous reports[3, 4, 5, 6, 7, 8, 9]. The report consists of statistical data summarized in graphical and tabular form, and a narrative describing the dose record characteristics which are necessary for the interpretation of the statistics. Separate reports of the detailed analysis of the data are published periodically by the NDR.

The tabulated data are divided into two major parts: 1. overall dose statistics and, 2. dose statistics by occupation. The overall statistics allow the comparison of regions and occupations in Canada. More detailed information for each occupation can be found in Table 4.

GENERAL COMMENTS

All doses are in International System (S.I.) Units and are presented to the nearest hundredth of a millisievert (1 mSv = 100 mrem). Unless indicated otherwise, whole body external doses less than 0.20 mSv are recorded as zero. A dash (-) in the tables indicates that no records exist for a given job category and region, whereas a zero (0) indicates that records are available but show no positive value

in the year. The words "dose" and "exposure" are used interchangeably in this report and doses may include committed dose equivalents as well as dose equivalents.

Doses for reactor workers include external whole body and tritium dose equivalents. The radon daughter exposure estimates for uranium mine workers are expressed in "Working Level Months" (WLM). One WLM is defined as the exposure to the lungs resulting from the inhalation of air containing one working level of radon daughters for 170 hours. The WLM is determined from the concentration of radon daughters in air samples taken from selected locations in the mine and the individual's occupancy factor at each of the locations.

Doses reported by the NDS are entered into the NDR at the time of processing. The 1985 statistics include doses reported for dosimeters issued for use in 1985 and returned by July 1986. However, doses recorded on dosimeters issued in 1984 which may have been worn in 1985 are not included in these statistics. As the statistics are determined in the same manner each year, the annual dose figures are based on a 12-month period, although this period may not be the strict calendar year.

Quarterly doses reported by outside organizations such as nuclear power generating stations and uranium mines are included to the extent that they have been received. The doses are representative of the calendar year only if the fourth quarter records have been received by the first of April of the following year. When statistics are based on partial data, the fact is indicated in the tables.

Job category designations are based on a standard list provided by the Registry and are updated when the Registry is notified. In the case of the NDS the job category is selected from the standard list by the individual or the organization. Nuclear reactor organizations have their own job classification schemes which are translated into the Registry's standardized list prior to submission of the records. The detailed breakdown for uranium mine workers has not yet been fully implemented. As a result, a single annual dose which includes all monitored workers in the uranium mining industry is quoted in the tables.

OVERALL DOSE STATISTICS

The overall dose statistics are presented in Tables 1 to 3 and Figures 1 to 3. Arithmetic averages including both exposed and unexposed workers are used throughout this section.

Table 1 shows the number of monitored workers by region for the past five years. Table 2 shows the distribution of the average whole body dose for the year by job category and provides a breakdown by provinces, territories and the entire country.

Table 3 shows for each job category the ninth decile dose and the number of whole body doses in excess of the ninth decile by region. To ensure that the ninth decile doses are based only on doses of occupationally exposed workers, all annual doses less than 0.5 mSv have been excluded from the computation. A zero in the ninth decile column of the table indicates that all annual doses for that job category are below 0.5 mSv.

The ninth decile of the dose distribution is determined by plotting the percentage of workers with a given whole body dose in mSv as the ordinate, and the whole body dose as the abscissa. Ninety percent of the members of the distribution will have doses less than the ninth decile while the upper 10 percent will have doses greater than or equal to this value.

Figure 1 shows the variation over 20 years of the average annual whole body dose for all workers, while Figure 2 shows the variation for selected job categories. The variation in the number of annual whole body doses greater than or equal to 50 mSv per 1000 workers is shown in Figure 3.

DOSE STATISTICS BY OCCUPATION

Table 4 provides a one-page detailed statistical summary for each job category, with an index on pages 14 and 15.

Each page consists of two tables, A and B, and a histogram. Table A provides statistical data for the current year as well as the previous year. Arithmetic averages are used throughout this section. The first average includes all monitored workers in the job category. The second excludes those workers with zero dose (less than 0.20 mSv) while the third excludes those with either zero dose or an annual dose greater than or equal to 30 mSv. The number of monitored workers with zero doses and those with annual doses greater than or equal to 30 mSv can be determined from Table B.

The ninth deciles are explained in the previous section and are summarized by occupation and region in Table 3. The number of workers whose doses were below 0.5 mSv and who have been excluded from the determination of the ninth decile can be obtained from Table B.

The relative frequency of exposures greater than 5 mSv is the number of annual doses exceeding 5 mSv divided by the number of workers in that job category. This relative frequency can be used to estimate the probability of a worker in a particular job category receiving an annual whole body dose in excess of 5 mSv.

The percentage contribution of each job category to the total collective dose is provided in the last line of the table. As some contributions to the total collective dose are very small only those greater than or equal to one percent are shown.

The histogram summarizes average doses for the last 10 years. Since the range of average doses varies considerably from one job category to another, the scale of the ordinate has been chosen to demonstrate best the annual variation in doses. Annual doses in the graph include both zero doses and doses greater than or equal to 30 mSv.

SUMMARY OF OVEREXPOSURE FOLLOW-UPS

The results of the investigation of NDS single dosimeter exposures in excess of regulatory limits are summarized in Table 5. These quarterly and yearly regulatory limits are currently based on the recommendations of ICRP 9[2].

The column "Type of Organization" indicates the broad area of activity of the employing organization. This usually includes a descriptor such as industrial, medical or research, but where a field is of particular interest or significance a finer breakdown may be used. The job category is primarily based on the NDR job classification scheme, but again if the occupation of the exposed worker is particularly significant a more appropriate description may be used.

For "Source of Exposure", descriptive names such as X-ray diagnostic unit, thickness gauge, etc. have been used.

The reason for the overexposure is briefly summarized in the column "Cause". Depending upon the type of radiation, the Atomic Energy Control Board and/or the provincial authorities investigate the overexposure incident; the Radiation Protection Bureau may or may not be directly involved. Following the investigation the appropriate regulatory authorities may make a recommendation to the NDR that changes be made to the individual's dose records. These are acted upon according to the NDR's established policies. In general all agencies tend to be conservative and hence, if it cannot be confirmed that the exposure was nonpersonal, it will remain on the individual's record as a personal dose.

REFERENCES

1. Ashmore J.P., and Grogan D., "The National Dose Registry for Radiation Workers in Canada", Radiation Protection Dosimetry, 11, 95-100 (1985).

2. "Recommendations of the International Commission on Radiological Protection", ICRP Publication 9, Pergamon, Oxford, 1966.

3. Ashmore J.P., Fujimoto K.R., Wilson J.A., and Grogan D., "Occupational Radiation Exposures in Canada - 1978", Environmental Health Directorate Publication 80-EHD-57, Department of National Health and Welfare, Canada.

4. Ashmore J.P., Fujimoto K.R., Wilson J.A., and Grogan D., "Occupational Radiation Exposures in Canada - 1979", Environmental Health Directorate Publication 81-EHD-72, Department of National Health and Welfare, Canada.

5. Ashmore J.P., Fujimoto K.R., Wilson J.A., and Grogan D., "Occupational Radiation Exposures in Canada - 1980", Environmental Health Directorate Publication 82-EHD-79, Department of National Health and Welfare, Canada.

6. Fujimoto K.R., Wilson J.A., Ashmore J.P., and Grogan D., "Occupational Radiation Exposures in Canada - 1981", Environmental Health Directorate Publication 83-EHD-104, Department of National Health and Welfare, Canada.

7. Fujimoto K.R., Wilson J.A., Ashmore J.P., and Grogan D., "Occupational Radiation Exposures in Canada - 1982", Environmental Health Directorate Publication 84-EHD-108, Department of National Health and Welfare, Canada.

8. Fujimoto K.R., Wilson J.A., Ashmore J.P., and Grogan D., "Occupational Radiation Exposures in Canada - 1983", Environmental Health Directorate Publication 85-EHD-115, Department of National Health and Welfare, Canada.

9. Fujimoto K.R., Wilson J.A., Ashmore J.P., and Grogan D., "Occupational Radiation Exposures in Canada - 1984", Environmental Health Directorate Publication 85-EHD-123, Department of National Health and Welfare, Canada.

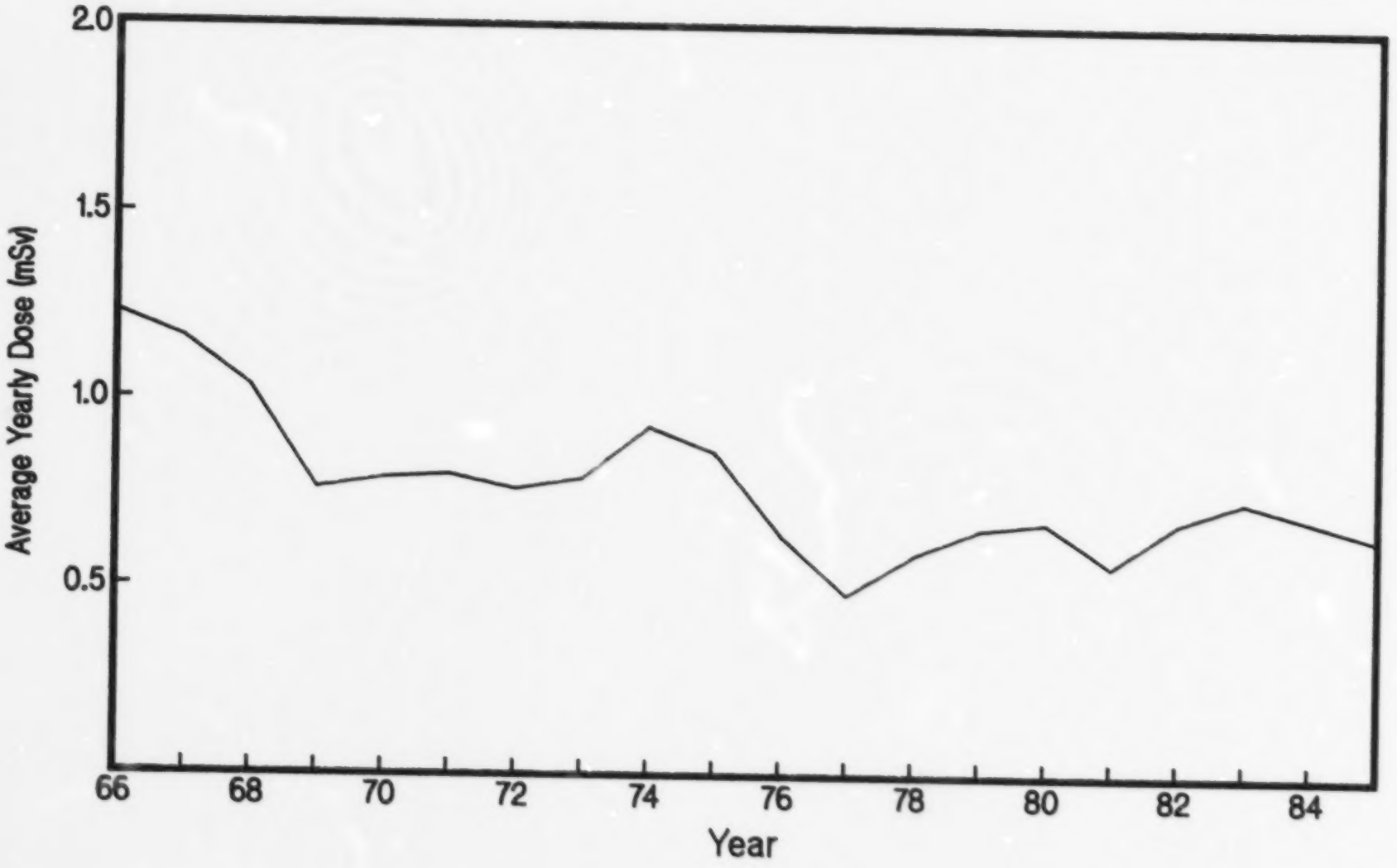

Figure 1. Variation of Average Whole Body Dose Over 20 Years

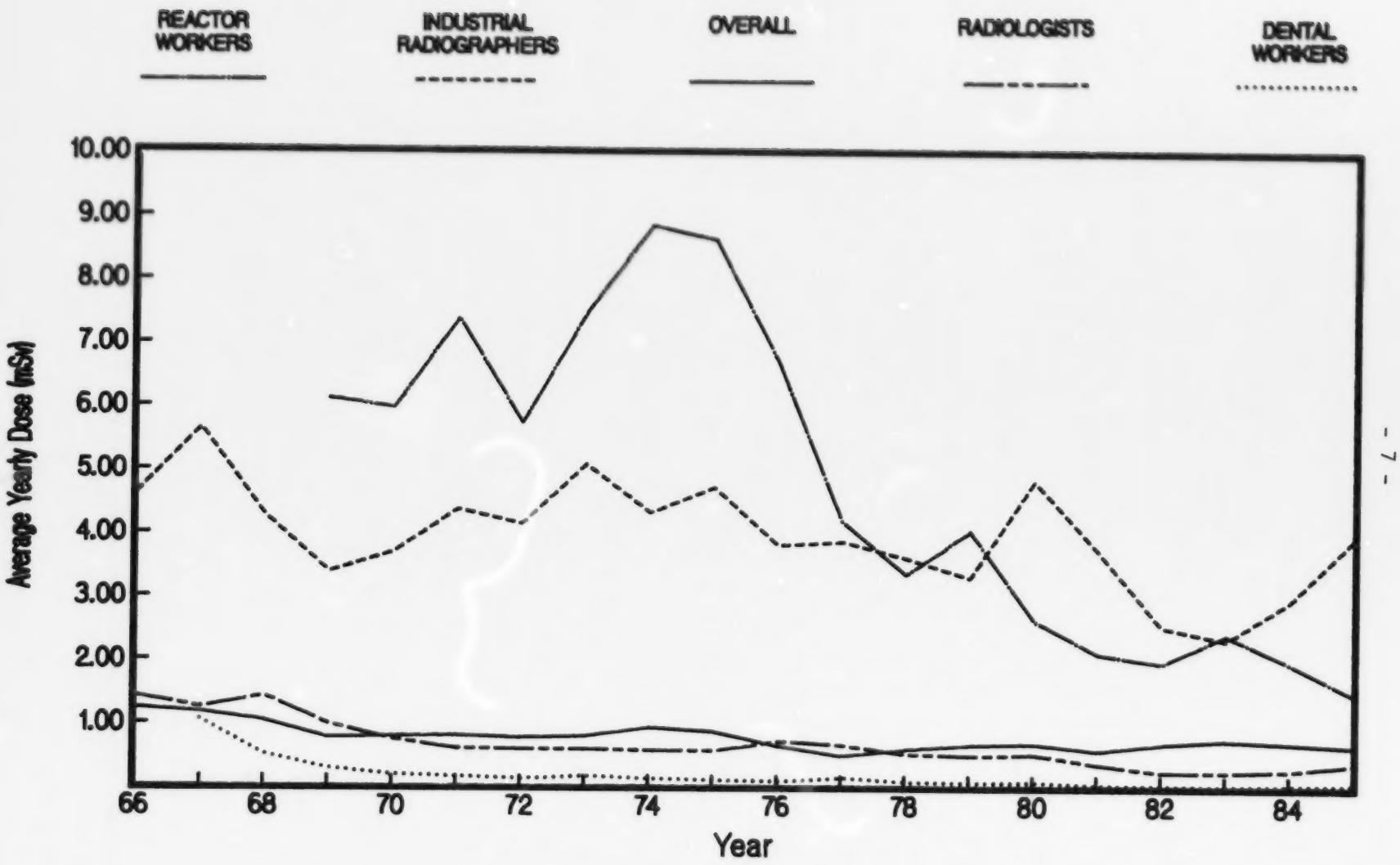

Figure 2. Average Whole Body Dose by Year (Selected Job Categories)

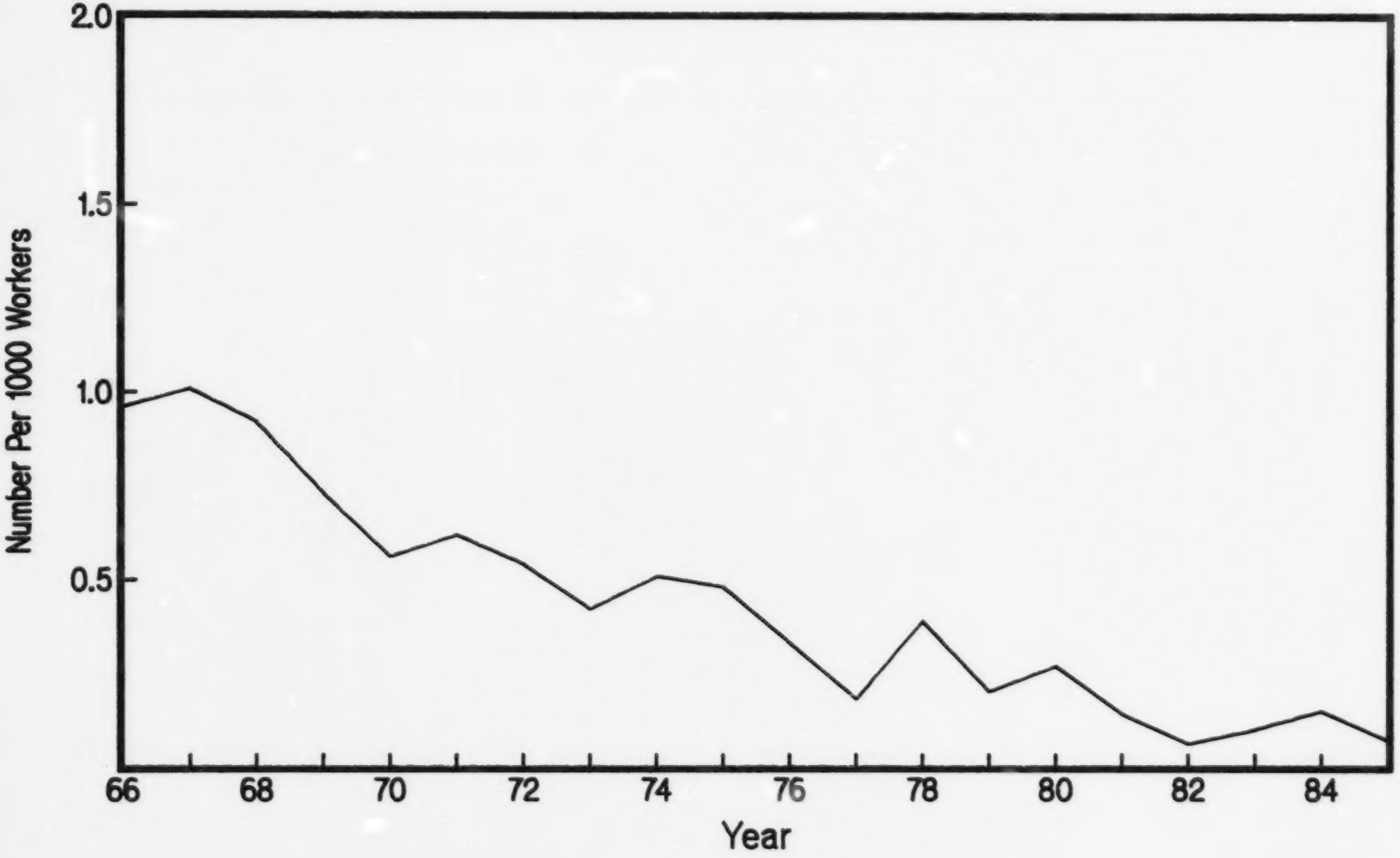

Figure 3. Yearly Whole Body Doses over 50 mSv

TABLE 1

NUMBER OF MONITORED WORKERS BY REGION - FIVE-YEAR SUMMARY

REGION	NUMBER OF WORKERS				
	1985	1984	1983	1982	1981
Newfoundland	1 216	1 164	1 164	1 201	1 138
Prince Edward Island	265	252	232	223	219
Nova Scotia	2 815	2 636	2 541	2 502	2 262
New Brunswick	2 064	2 022	2 198	2 331	1 194
Quebec	18 263	17 425	16 616	16 499	15 971
Ontario	53 361	52 187	51 135	49 959	43 184
Manitoba	4 270	4 250	4 182	4 053	3 800
Saskatchewan	4 895	5 080	4 533	4 954	5 033
Alberta	9 635	9 036	8 588	8 380	8 156
British Columbia	7 798	7 592	7 427	7 315	7 177
Northwest Territories	288	296	286	239	281
Yukon	124	131	133	118	151
TOTAL	104 994	102 071	99 035	97 774	88 506

TABLE 2

AVERAGE WHOLE BODY DOSE IN mSv (ALL DOSES) BY JOB CATEGORY AND REGION - 1985

JOB CATEGORY	REGION												
	NFLD	PEI	NS	NB	QUE	ONT	MAN	SASK	ALTA	BC	NWT	YUKON	CANADA
ADMINISTRATIVE													
Administrator	0.50	-	0.00	-	0.58	0.09	0.00	0.00	0.28	0.03	-	-	0.19
Office Staff	0.05	0.07	0.08	0.19	0.09	0.06	0.07	0.06	0.06	0.14	0.00	-	0.07
Safety Officer	-	-	0.00	0.00	0.13	0.61	0.00	-	-	0.20	0.00	-	0.35
INDUSTRIAL AND RESEARCH													
Dial Painter	-	-	-	-	0.00	0.07	-	-	0.30	0.00	-	-	0.07
Instructor	0.26	-	0.18	-	0.16	0.08	0.03	0.25	0.15	0.12	-	-	0.12
Instrument Technician	0.03	-	0.20	0.63	0.55	0.23	0.10	0.91	0.28	0.12	-	-	0.31
Laboratory Technician	0.24	0.65	0.07	0.38	0.53	0.21	0.24	0.24	0.14	0.55	6.75	0.17	0.29
Nuclear Fuel Processor	-	-	-	-	1.55	2.44	-	-	0.61	-	-	-	1.96
Radiographer (Industrial)	1.56	0.00	1.86	3.20	2.26	2.16	0.60	1.66	8.83	2.18	-	0.20	3.93
Scientist/Engineer (Field)	1.00	-	0.47	1.12	0.16	0.49	0.24	0.46	1.31	0.22	-	0.00	0.65
Scientist/Engineer (Lab)	0.15	-	0.11	0.15	0.17	0.19	0.13	0.36	0.17	0.38	-	0.00	0.20
Well Logger	0.24	-	0.09	-	0.00	2.46	-	1.06	1.60	1.70	1.45	0.00	1.54
MEDICAL													
Chiropractor	-	-	0.00	0.00	0.11	0.08	0.03	0.03	0.08	0.06	-	-	0.08
Dental Hygienist	0.10	0.04	0.04	0.04	0.02	0.05	0.03	0.07	0.05	0.04	0.00	0.00	0.04
Dentist	0.04	0.03	0.03	0.13	0.05	0.05	0.03	0.06	0.32	0.05	0.02	0.00	0.06
Gynaecologist	-	-	0.00	0.27	0.27	0.21	0.00	-	2.91	0.17	-	-	0.85
Isotope Technician	5.93	2.83	2.22	3.14	3.02	2.22	1.34	1.13	1.56	0.61	-	-	2.09
Laboratory Technician	0.16	0.00	0.11	1.84	0.29	0.17	0.09	0.20	0.17	0.21	0.00	-	0.19
Medical Physicist	0.10	-	0.73	0.37	0.58	0.56	0.00	0.51	0.21	0.62	-	0.00	0.53
Nurse	0.14	0.23	0.16	1.10	0.17	0.19	0.25	0.15	0.16	0.07	0.08	0.11	0.19

TABLE 2 (cont'd)

JOB CATEGORY	REGION												
	NFLD	PEI	NS	NB	QUE	ONT	MAN	SASK	ALTA	BC	NWT	YUKON	CANADA
MEDICAL (cont'd)													
Physician	0.14	0.00	0.10	0.26	0.40	0.32	0.17	0.18	0.25	0.57	0.05	0.00	0.34
Rad. Tech. (Diagnostic)	0.23	0.12	0.21	0.19	0.22	0.16	0.16	0.17	0.16	0.11	0.01	0.08	0.17
Rad. Tech. (Therapeutic)	1.02	-	1.56	0.75	1.46	1.17	0.90	0.92	0.78	0.83	-	-	1.10
Radiologist (Diagnostic)	0.34	0.05	0.37	0.65	0.45	0.33	0.16	0.31	0.15	0.29	-	-	0.35
Radiologist (Therapeutic)	0.75	-	0.30	0.81	1.08	0.60	0.19	0.16	0.74	0.34	-	-	0.61
Veterinarian	0.22	0.12	0.20	0.05	0.04	0.16	0.11	0.11	0.08	0.21	-	-	0.14
Ward Aid/Orderly	0.13	0.15	0.35	0.09	0.13	0.12	0.11	0.21	0.10	0.12	0.00	0.40	0.13
MINE WORKERS													
Uranium Miner	-	-	-	-	-	2.38	-	1.20	-	-	-	-	2.12
REACTOR WORKERS (By Function)													
Admin/Security/Janitor	-	-	-	0.02	0.07	0.26	-	-	-	-	-	-	0.23
Chem. and Rad. Control	-	-	-	0.22	2.20	3.91	-	-	-	-	-	-	3.62
Construction	-	-	-	3.40	1.26	0.83	-	-	-	-	-	-	0.84
Control Technician	-	-	-	0.80	1.55	1.72	-	-	-	-	-	-	1.69
Electrical Maintenance	-	-	-	0.28	3.96	1.61	-	-	-	-	-	-	1.35
Fuel Handling	-	-	-	4.39	2.24	1.85	-	-	-	-	-	-	2.20
General Maintenance	-	-	-	0.42	1.31	0.93	-	-	-	-	-	-	0.92
Health Physics	-	-	-	1.87	0.56	0.95	-	-	-	-	-	-	1.11
Mechanical Maintenance	-	-	-	1.91	5.68	4.82	-	-	-	-	-	-	4.64
Reactor Operations	-	-	-	1.65	1.01	4.21	-	-	-	-	-	-	3.84
Scientific/Professional	-	-	-	0.21	0.53	0.34	-	-	-	-	-	-	0.34
Training	-	-	-	0.21	0.06	0.91	-	-	-	-	-	-	0.27
Visitor	-	-	-	0.75	2.61	0.32	-	-	-	-	-	-	0.62
OVERALL	0.32	0.19	0.22	0.69	0.39	0.77	0.14	0.51	1.14	0.31	0.15	0.08	0.64

TABLE 3

NINTH DECILE DOSE SUMMARY BY JOB CATEGORY AND REGION - 1985

JOB CATEGORY	NUMBER OF ANNUAL DOSES IN EXCESS OF THE NINTH DECILE												NINTH DECILE (mSv)
	NFLD	PEI	NS	NB	QUE	ONT	MAN	SASK	ALTA	BC	NWT	YUKON	
ADMINISTRATIVE													
Administrator	0	0	0	0	1	0	0	0	0	0	0	0	1.10
Office Staff	0	0	0	1	4	3	0	0	0	1	0	0	3.20
Safety Officer	0	0	0	0	0	1	0	0	0	0	0	0	0.70
INDUSTRIAL AND RESEARCH													
Dial Painter													*
Instructor	0	0	0	0	1	0	0	0	1	0	0	0	1.00
Instrument Technician	0	0	0	0	7	6	0	1	2	0	0	0	3.60
Laboratory Technician	1	2	0	0	13	7	1	0	0	9	1	0	5.00
Nuclear Fuel Processor	0	0	0	0	0	6	0	0	0	0	0	0	6.10
Radiographer (Industrial)	0	0	0	0	6	8	0	0	56	1	0	0	21.00
Scientist/Engineer (Field)	1	0	0	1	0	4	0	0	7	0	0	0	4.30
Scientist/Engineer (Lab)	0	0	0	0	5	7	1	1	2	6	0	0	2.80
Well Logger	0	0	0	0	0	1	0	0	56	1	0	0	6.00
MEDICAL													
Chiropractor	0	0	0	0	1	1	0	0	0	0	0	0	1.70
Dental Hygienist	0	0	0	0	1	5	0	0	1	2	0	0	1.60
Dentist	0	0	0	1	3	5	0	0	4	1	0	0	1.90
Gynaecologist	0	0	0	0	0	0	0	0	1	0	0	0	0.60
Isotope Technician	3	0	0	0	33	14	1	0	3	1	0	0	6.80
Laboratory Technician	0	0	0	1	6	7	0	1	2	2	0	0	5.00
Medical Physicist	0	0	0	0	1	2	0	0	0	1	0	0	5.70
Nurse	0	0	1	8	6	13	1	0	3	0	0	0	2.90

* Insufficient data available for calculation

TABLE 3 (cont'd)

JOB CATEGORY	NUMBER OF ANNUAL DOSES IN EXCESS OF THE NINTH DECILE												NINTH DECILE (mSv)
	NFLD	PEI	NS	NB	QUE	ONT	MAN	SASK	ALTA	BC	NWT	YUKON	
MEDICAL (cont'd)													
Physician	0	0	0	0	11	10	0	1	2	4	0	0	3.10
Rad. Tech. (Diagnostic)	1	0	5	0	24	26	4	2	9	8	0	0	2.40
Rad. Tech. (Therapeutic)	1	0	1	1	14	7	1	0	1	0	0	0	3.80
Radiologist (Diagnostic)	0	0	2	2	12	7	0	1	0	3	0	0	3.30
Radiologist (Therapeutic)	0	0	0	1	2	1	0	0	1	0	0	0	2.80
Veterinarian	0	0	1	0	0	7	0	0	0	3	0	0	2.40
Ward Aid/Orderly	0	0	0	0	8	1	0	0	0	1	0	0	2.40
MINE WORKERS													
Uranium Miner	0	0	0	0	0	343	0	38	0	0	0	0	7.10
REACTOR WORKERS (By Function)													
Admin/Security/Janitor	0	0	0	0	0	28	0	0	0	0	0	0	5.20
Chem. and Rad. Control	0	0	0	0	0	24	0	0	0	0	0	0	14.67
Construction	0	0	0	0	1	38	0	0	0	0	0	0	9.70
Control Technician	0	0	0	0	3	33	0	0	0	0	0	0	8.25
Electrical Maintenance	0	0	0	0	3	9	0	0	0	0	0	0	6.15
Fuel Handling	0	0	0	3	1	6	0	0	0	0	0	0	9.01
General Maintenance	0	0	0	0	7	40	0	0	0	0	0	0	7.63
Health Physics	0	0	0	1	0	2	0	0	0	0	0	0	6.68
Mechanical Maintenance	0	0	0	0	2	75	0	0	0	0	0	0	17.60
Reactor Operations	0	0	0	0	0	92	0	0	0	0	0	0	15.49
Scientific/Professional	0	0	0	1	2	20	0	0	0	0	0	0	5.45
Training	0	0	0	0	0	1	0	0	0	0	0	0	2.37
Visitor	0	0	0	0	4	0	0	0	0	0	0	0	1.90

STATISTICAL DATA BY JOB CATEGORY

IN TABLE 4

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ADMINISTRATIVE

Administrator 16
Office Staff 17
Safety Officer 18

INDUSTRIAL and RESEARCH

Dial Painter 19
Instructor 20
Instrument Technician 21
Laboratory Technician 22
Nuclear Fuel Processor 23
Radiographer (Industrial) 24
Scientist/Engineer (Field) 25
Scientist/Engineer (Laboratory) 26
Well Logger 27

MEDICAL

Chiropractor 28
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Visitor 57

TABLE 4

ADMINISTRATIVE - ADMINISTRATOR

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.19	0.12
Average Dose (mSv) (Zero doses removed)	0.73	0.62
Average Dose (mSv) (Zero and high doses removed)	0.73	0.62
Ninth Decile Dose (mSv)	1.10	0.60
Relative Frequency of Annual Doses $\geq$5.00 mSv (x 10^{-4})	<1	<1
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	37
0.20 - 0.49	8
0.50 - 4.99	5
5.00 - 29.9	0
30.0 - 49.9	0
$\geq$50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

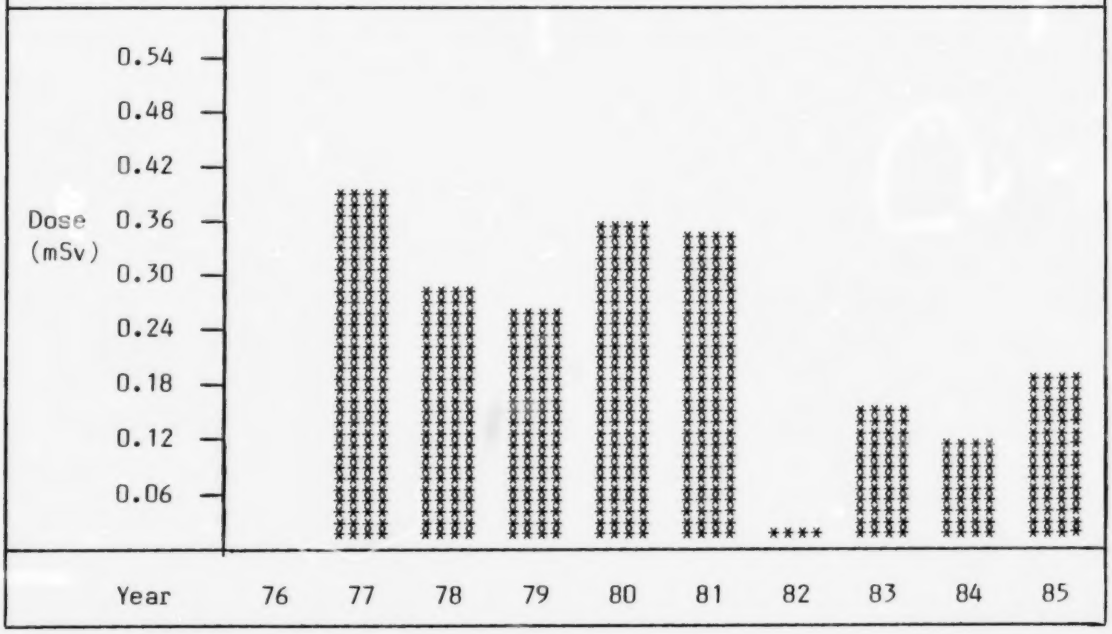


TABLE 4 (Cont'd)

ADMINISTRATIVE - OFFICE STAFF

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.07	0.03
Average Dose (mSv) (Zero doses removed)	0.63	0.67
Average Dose (mSv) (Zero and high doses removed)	0.63	0.67
Ninth Decile Dose (mSv)	3.20	2.50
Relative Frequency of Annual Doses ≥5.00 mSv ($\times 10^{-4}$)	18	<1
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	2016
0.20 - 0.49	178
0.50 - 4.99	85
5.00 - 29.9	4
30.0 - 49.9	0
≥50.0	0

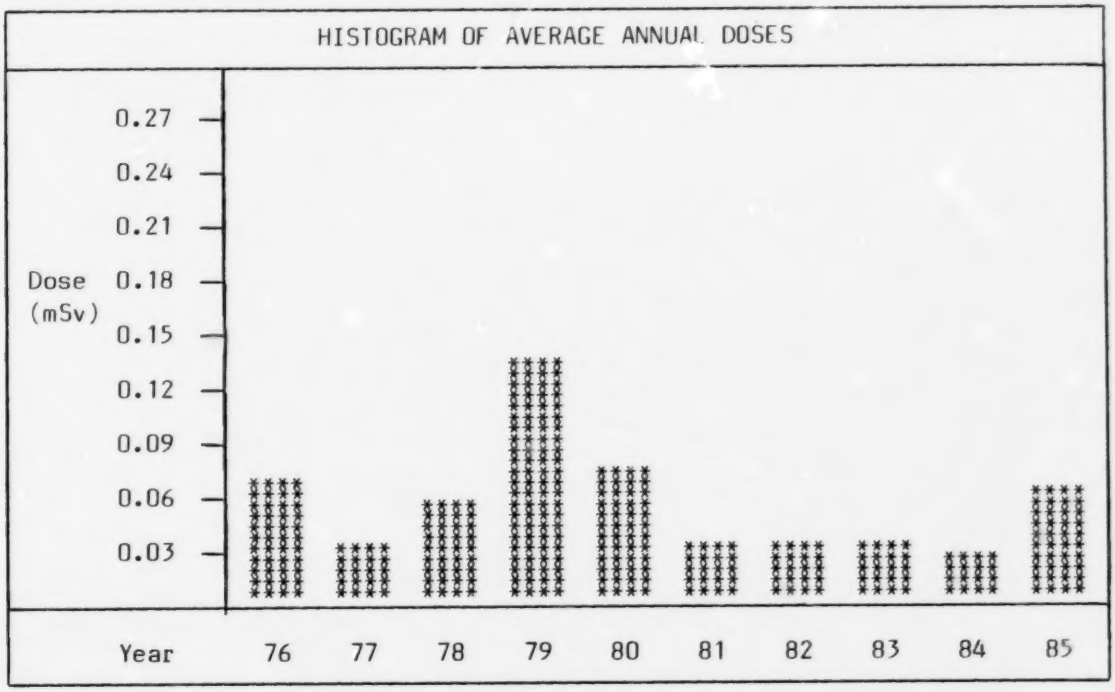


TABLE 4 (Cont'd)

ADMINISTRATIVE - SAFETY OFFICER

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.35	0.18
Average Dose (mSv) (Zero doses removed)	0.85	0.56
Average Dose (mSv) (Zero and high doses removed)	0.85	0.56
Ninth Decile Dose (mSv)	0.70	0.50
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	350	<1
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	17
0.20 - 0.49	5
0.50 - 4.99	6
5.00 - 29.9	1
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

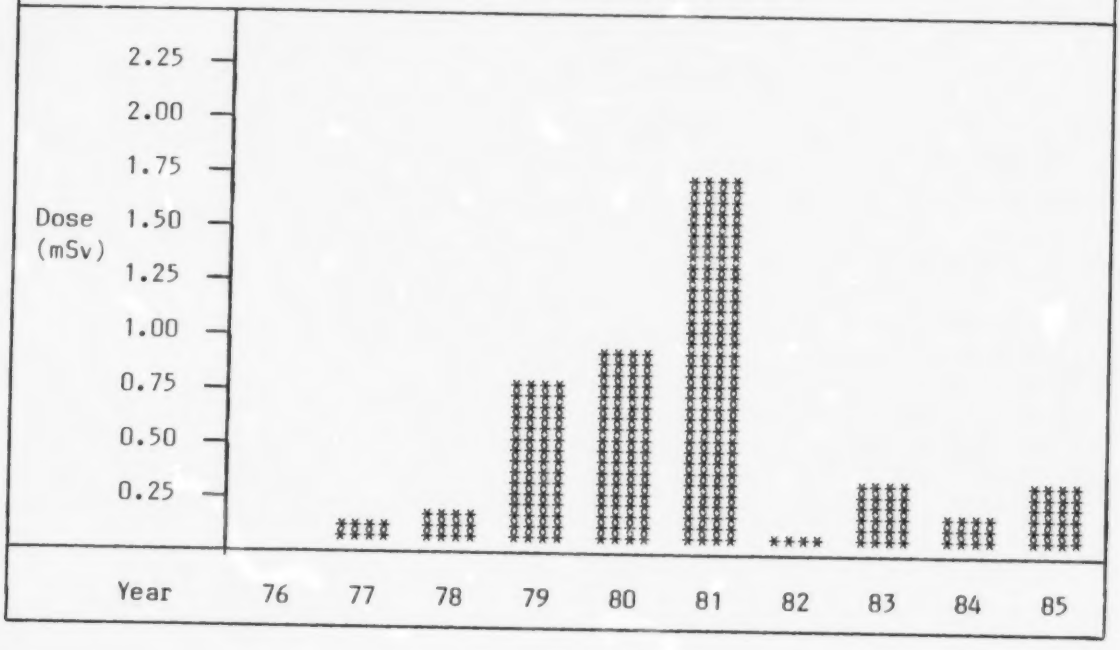


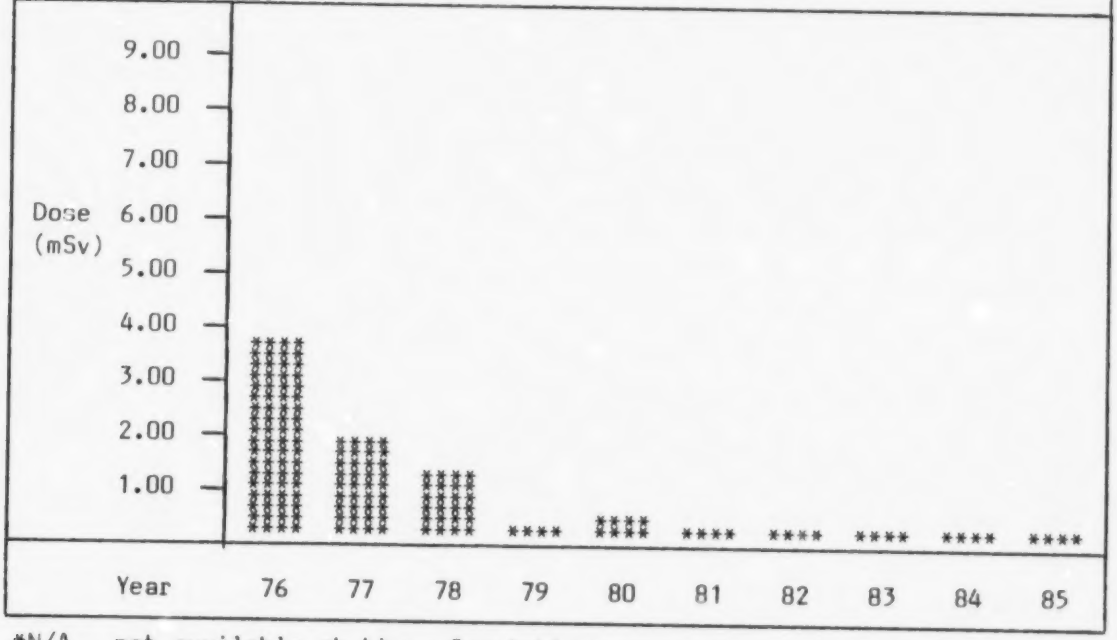
TABLE 4 (Cont'd)

INDUSTRIAL AND RESEARCH - DIAL PAINTER

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.07	0.39
Average Dose (mSv) (Zero doses removed)	0.25	1.75
Average Dose (mSv) (Zero and high doses removed)	0.25	1.75
Ninth Decile Dose (mSv)	N/A*	3.20
Relative Frequency of Annual Doses ≥5.00 mSv ($\times 10^{-4}$)	<1	<1
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	5
0.20 - 0.49	2
0.50 - 4.99	0
5.00 - 29.9	0
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES



*N/A - not available at time of printing

TABLE 4 (Cont'd)

INDUSTRIAL AND RESEARCH - INSTRUCTOR

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.12	0.08
Average Dose (mSv) (Zero doses removed)	1.42	0.59
Average Dose (mSv) (Zero and high doses removed)	0.42	0.59
Ninth Decile Dose (mSv)	1.00	1.00
Relative Frequency of Annual Doses ≥5.00 mSv ($\times 10^{-4}$)	<1	1
Percentage Contribution to Collective Dose (All doses)	<1	1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	91
0.20 - 0.49	24
0.50 - 4.99	14
5.00 - 29.9	0
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

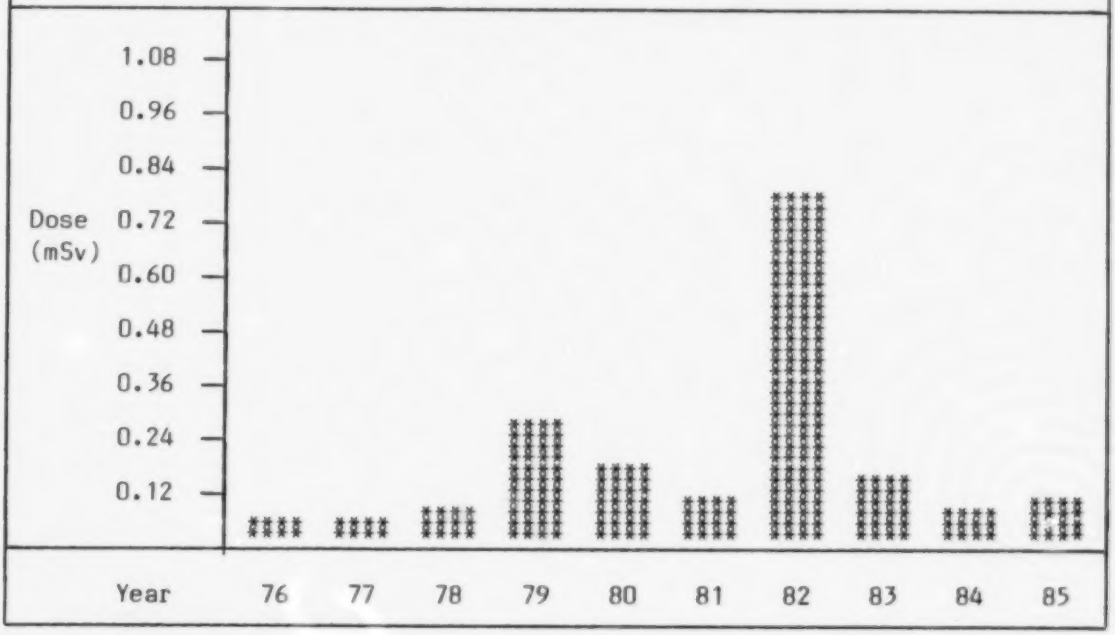


TABLE 4 (Cont'd)

INDUSTRIAL AND RESEARCH - INSTRUMENT TECHNICIAN

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.31	0.24
Average Dose (mSv) (Zero doses removed)	0.91	1.05
Average Dose (mSv) (Zero and high doses removed)	0.91	0.92
Ninth Decile Dose (mSv)	3.60	3.50
Relative Frequency of Annual Doses $\geq$5.00 mSv (x 10^{-4})	100	80
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	677
0.20 - 0.49	203
0.50 - 4.99	140
5.00 - 29.9	11
30.0 - 49.9	0
$\geq$50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

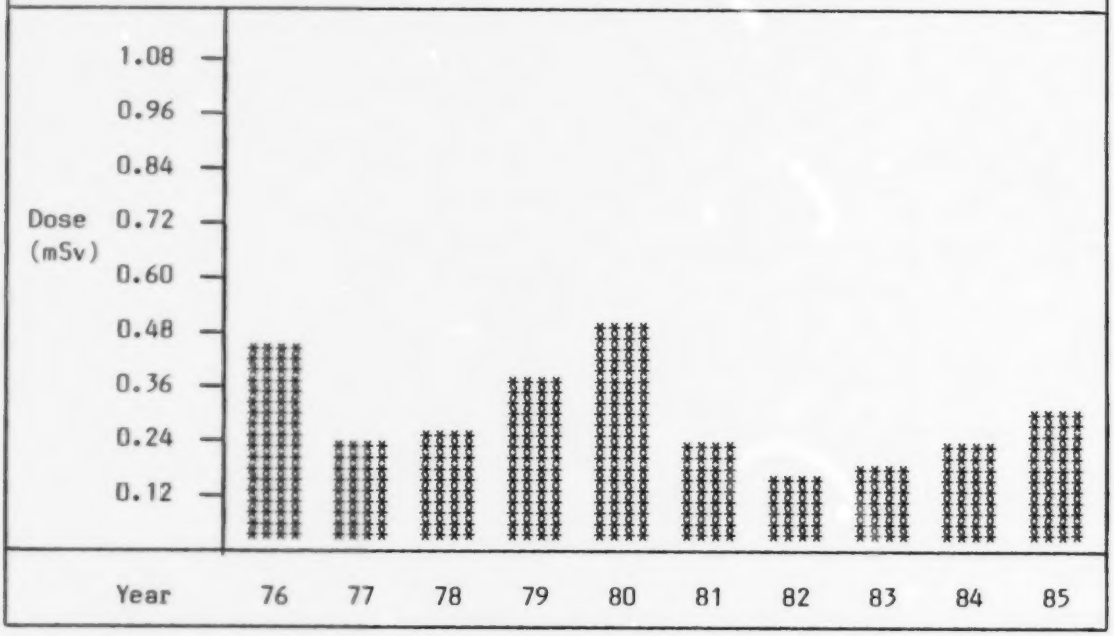


TABLE 4 (Cont'd)

INDUSTRIAL AND RESEARCH - LABORATORY TECHNICIAN

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.29	0.20
Average Dose (mSv) (Zero doses removed)	0.90	1.12
Average Dose (mSv) (Zero and high doses removed)	0.90	1.12
Ninth Decile Dose (mSv)	5.00	5.50
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	140	100
Percentage Contribution to Collective Dose (All doses)	1	<1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	1883
0.20 - 0.49	546
0.50 - 4.99	315
5.00 - 29.9	38
30.0 - 49.9	0
≥50.0	0

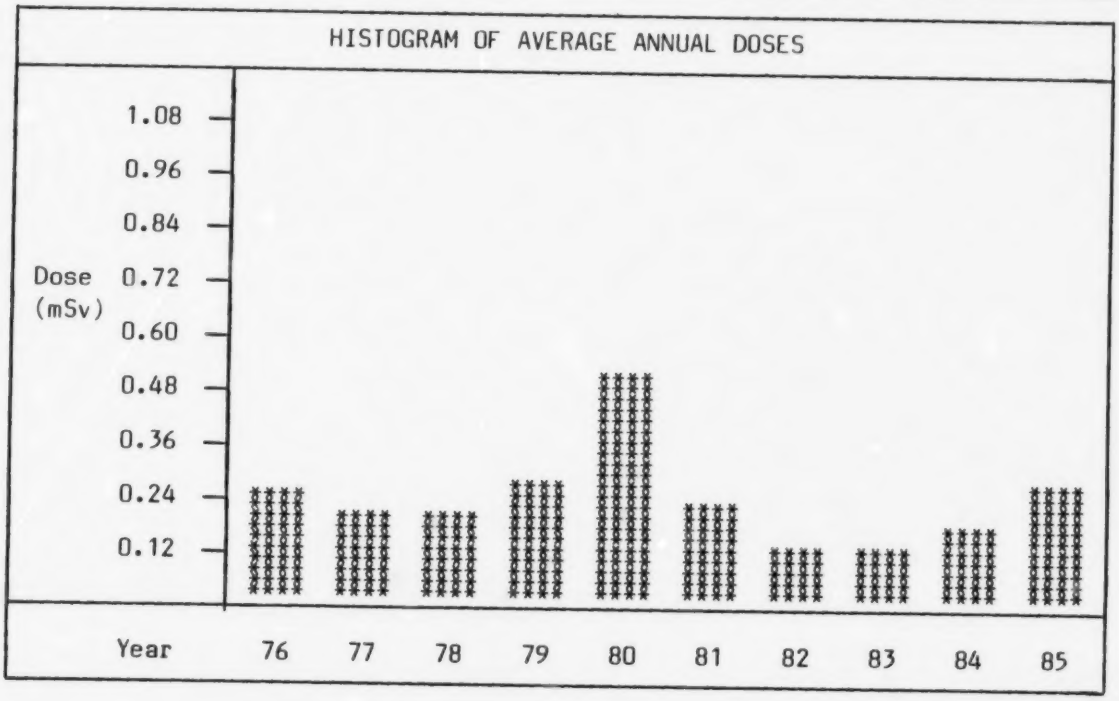


TABLE 4 (Cont'd)

INDUSTRIAL AND RESEARCH - NUCLEAR FUEL PROCESSOR

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	1.96	1.46
Average Dose (mSv) (Zero doses removed)	2.31	2.10
Average Dose (mSv) (Zero and high doses removed)	2.31	2.10
Ninth Decile Dose (mSv)	6.10	5.40
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	1270	710
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	12
0.20 - 0.49	10
0.50 - 4.99	47
5.00 - 29.9	10
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

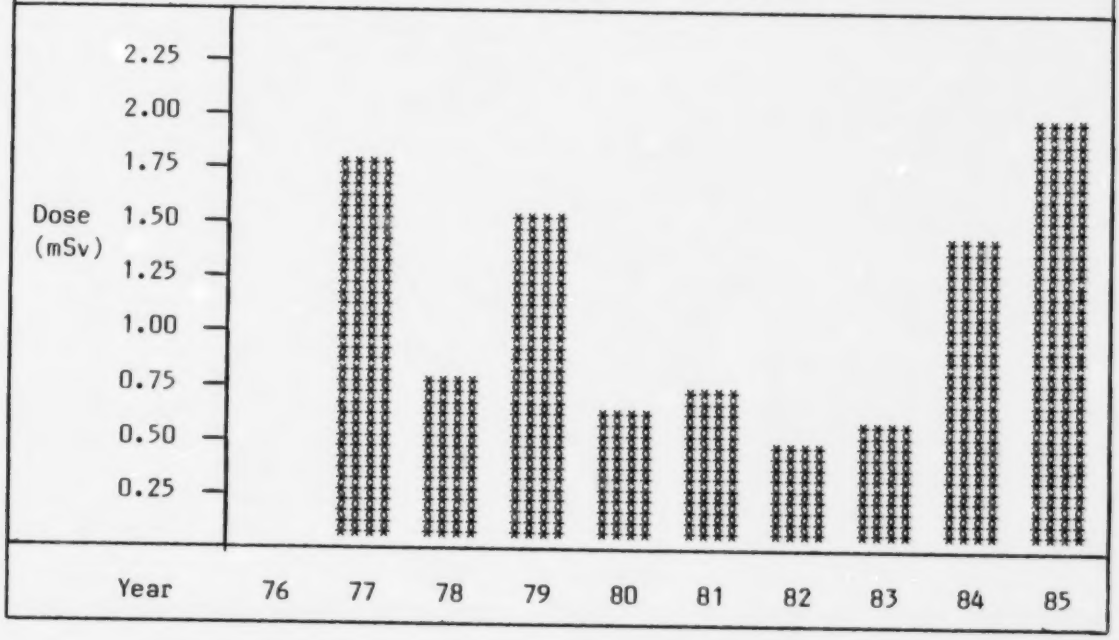


TABLE 4 (Cont'd)

INDUSTRIAL AND RESEARCH - RADIOGRAPHER (INDUSTRIAL)

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	3.93	2.94
Average Dose (mSv) (Zero doses removed)	6.44	5.92
Average Dose (mSv) (Zero and high doses removed)	5.51	4.70
Ninth Decile Dose (mSv)	21.00	16.90
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	2360	1700
Percentage Contribution to Collective Dose (All doses)	9	6

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	577
0.20 - 0.49	185
0.50 - 4.99	370
5.00 - 29.9	324
30.0 - 49.9	26
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

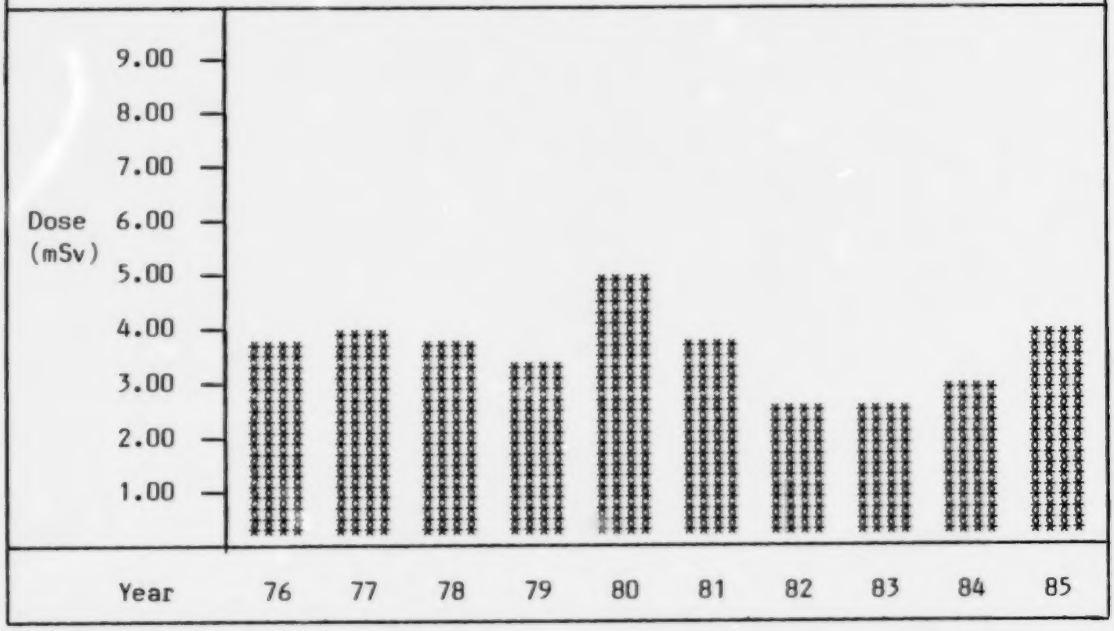


TABLE 4 (Cont'd)

INDUSTRIAL AND RESEARCH - SCIENTIST/ENGINEER (FIELD)

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.65	0.76
Average Dose (mSv) (Zero doses removed)	1.48	1.90
Average Dose (mSv) (Zero and high doses removed)	1.34	1.53
Ninth Decile Dose (mSv)	4.30	5.90
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	210	290
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	265
0.20 - 0.49	87
0.50 - 4.99	112
5.00 - 29.9	9
30.0 - 49.9	1
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

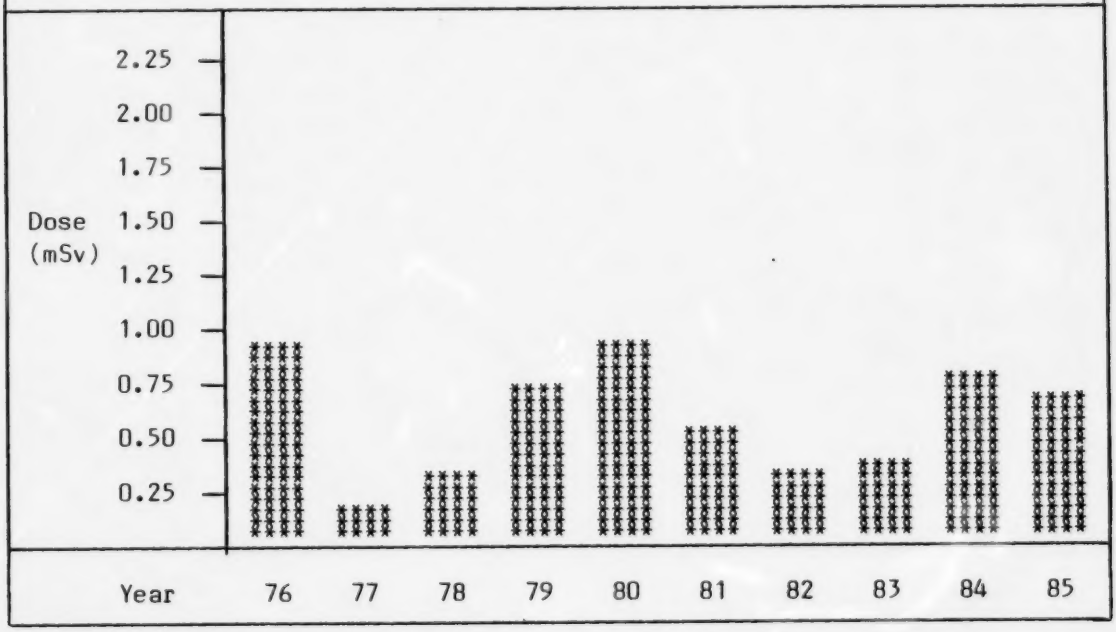


TABLE 4 (Cont'd)

INDUSTRIAL AND RESEARCH - SCIENTIST/ENGINEER (LABORATORY)

TABLE A

DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.20	0.15
Average Dose (mSv) (Zero doses removed)	0.59	0.82
Average Dose (mSv) (Zero and high doses removed)	0.59	0.82
Ninth Decile Dose (mSv)	2.80	3.30
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	40	50
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B

DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	1456
0.20 - 0.49	531
0.50 - 4.99	226
5.00 - 29.9	8
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

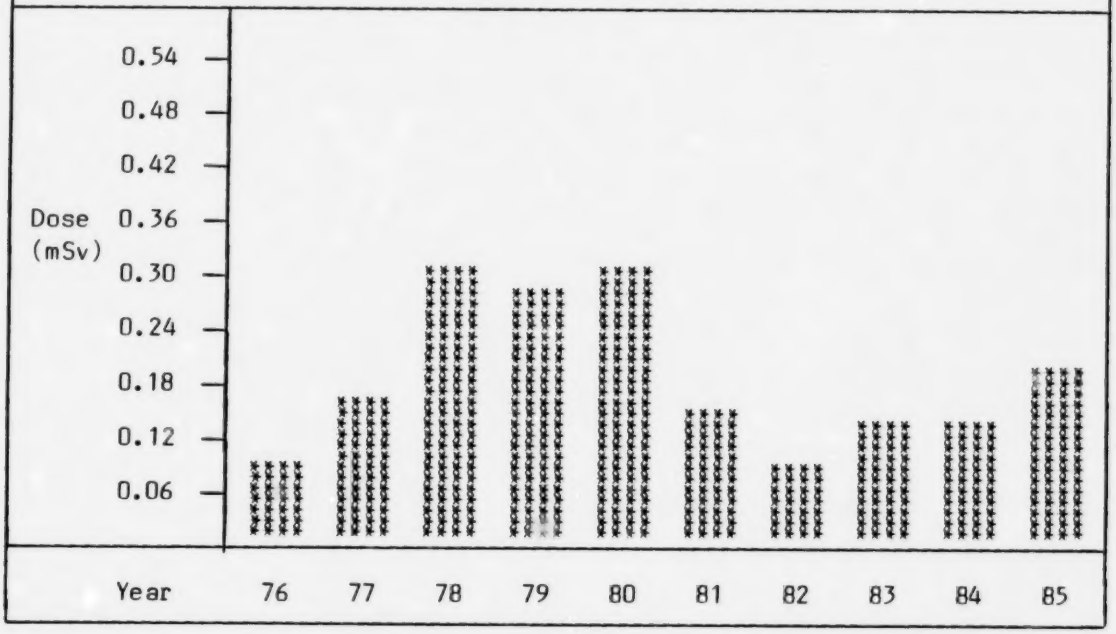


TABLE 4 (Cont'd)

INDUSTRIAL AND RESEARCH - WELL LOGGER

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	1.54	1.64
Average Dose (mSv) (Zero doses removed)	2.16	2.43
Average Dose (mSv) (Zero and high doses removed)	2.16	2.09
Ninth Decile Dose (mSv)	6.00	6.20
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	770	750
Percentage Contribution to Collective Dose (All doses)	3	2

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	323
0.20 - 0.49	177
0.50 - 4.99	534
5.00 - 29.9	86
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

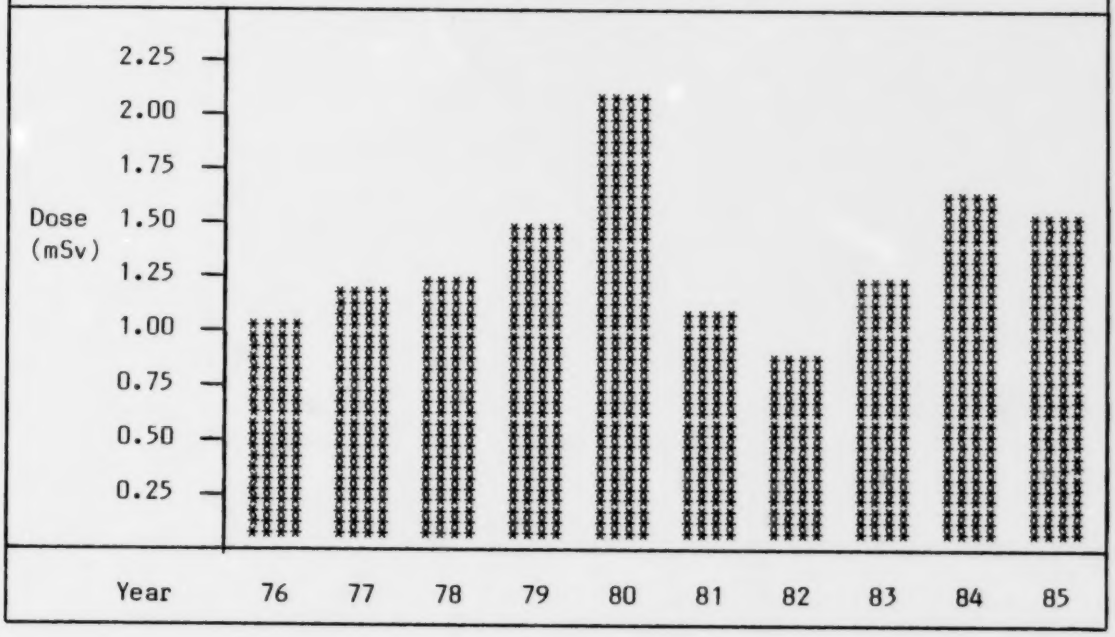


TABLE 4 (Cont'd)

MEDICAL - CHIROPRACTOR

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.08	0.06
Average Dose (mSv) (Zero doses removed)	0.42	0.62
Average Dose (mSv) (Zero and high doses removed)	0.42	0.62
Ninth Decile Dose (mSv)	1.70	1.60
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	15	15
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	562
0.20 - 0.49	105
0.50 - 4.99	22
5.00 - 29.9	1
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

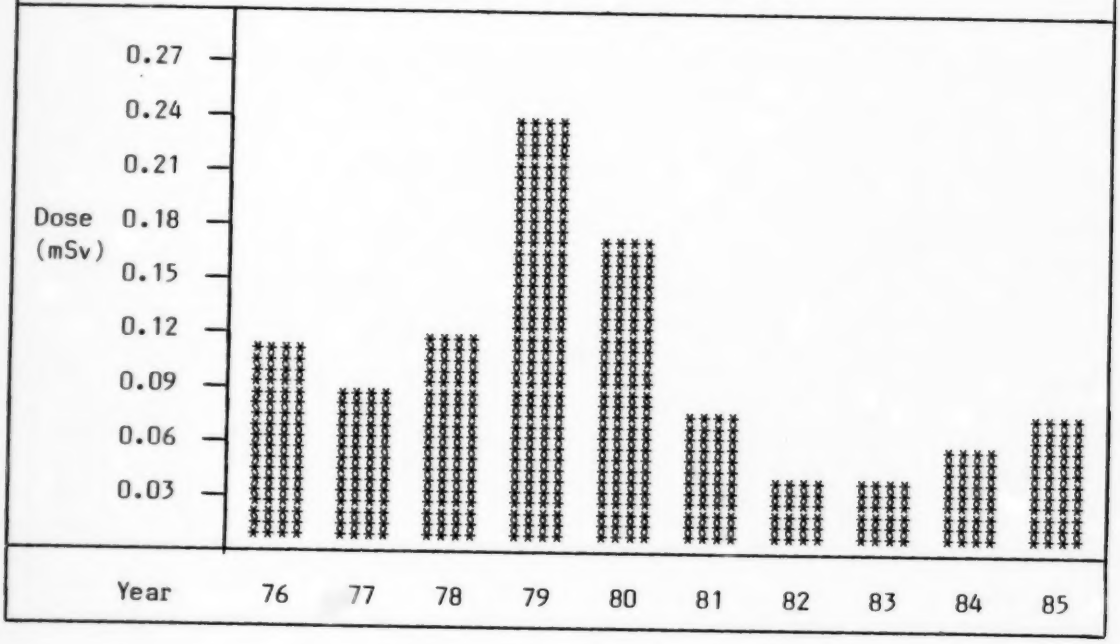


TABLE 4 (Cont'd)

MEDICAL - DENTAL HYGIENIST

TABLE A

DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.04	0.02
Average Dose (mSv) (Zero doses removed)	0.47	0.72
Average Dose (mSv) (Zero and high doses removed)	0.47	0.43
Ninth Decile Dose (mSv)	1.60	1.20
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	2	2
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B

DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	3721
0.20 - 0.49	298
0.50 - 4.99	89
5.00 - 29.9	1
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

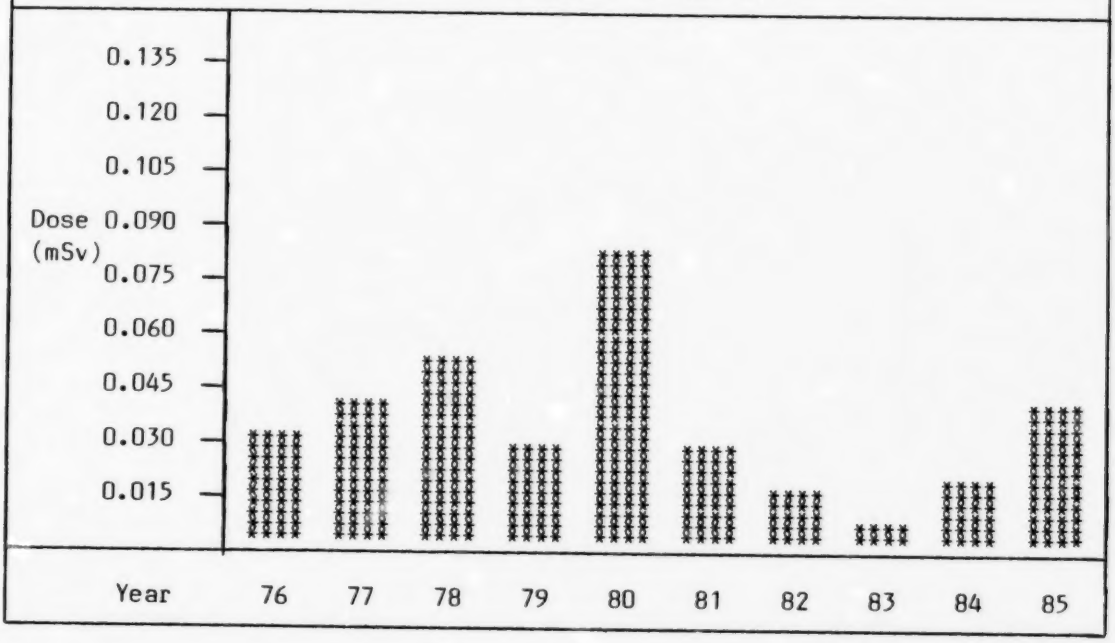


TABLE 4 (Cont'd)

MEDICAL - DENTIST

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.06	0.05
Average Dose (mSv) (Zero doses removed)	0.65	1.43
Average Dose (mSv) (Zero and high doses removed)	0.65	0.52
Ninth Decile Dose (mSv)	1.90	2.50
Relative Frequency of Annual Doses ≥5.00 mSv ($\times 10^{-4}$)	15	4
Percentage Contribution to Collective Dose (All doses)	<1	1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	4344
0.20 - 0.49	317
0.50 - 4.99	126
5.00 - 29.9	7
30.0 - 49.9	0
≥50.0	0

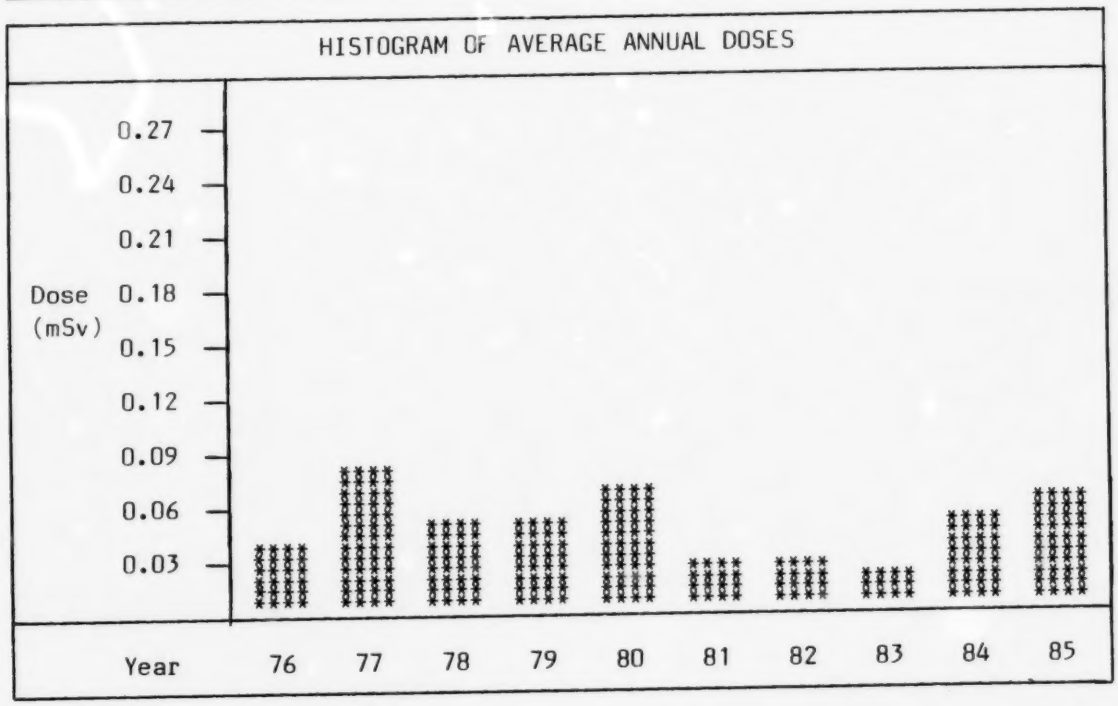


TABLE 4 (Cont'd)

MEDICAL - GYNAECOLOGIST

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.85	0.49
Average Dose (mSv) (Zero doses removed)	2.47	3.24
Average Dose (mSv) (Zero and high doses removed)	2.47	3.24
Ninth Decile Dose (mSv)	0.60	1.20
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	315	300
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	21
0.20 - 0.49	6
0.50 - 4.99	4
5.00 - 29.9	1
30.0 - 49.9	0
≥50.0	0

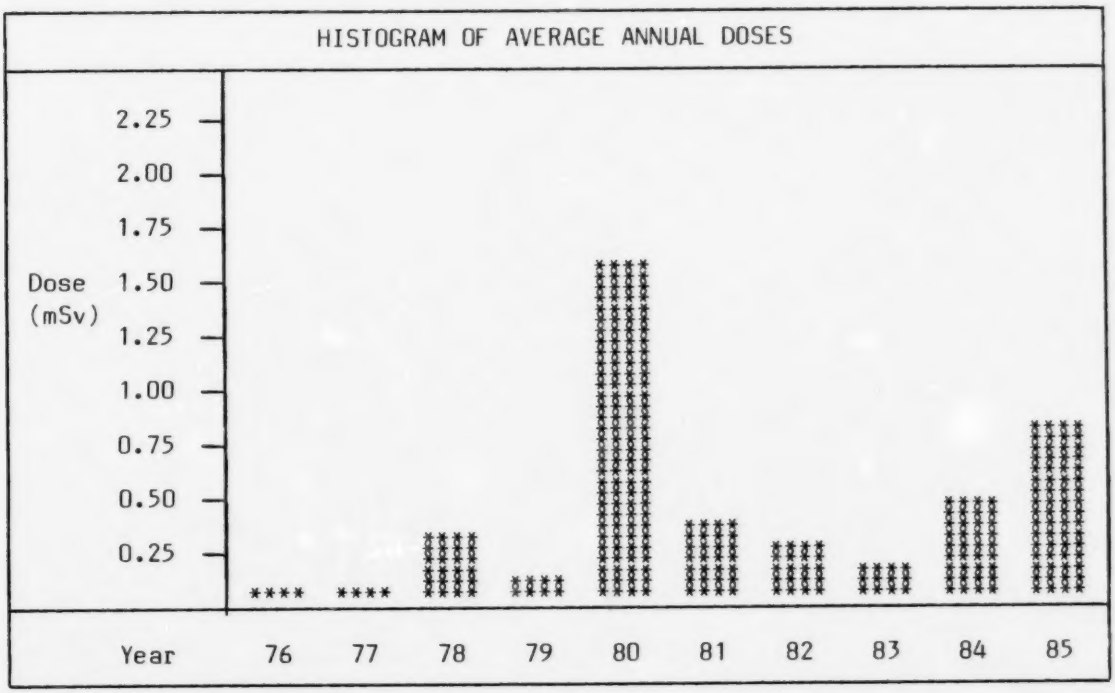


TABLE 4 (Cont'd)

MEDICAL - ISOTOPE TECHNICIAN

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	2.09	1.99
Average Dose (mSv) (Zero doses removed)	3.00	2.86
Average Dose (mSv) (Zero and high doses removed)	3.00	2.86
Ninth Decile Dose (mSv)	6.80	7.00
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	1190	1100
Percentage Contribution to Collective Dose (All doses)	3	2

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	223
0.20 - 0.49	91
0.50 - 4.99	440
5.00 - 29.9	102
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

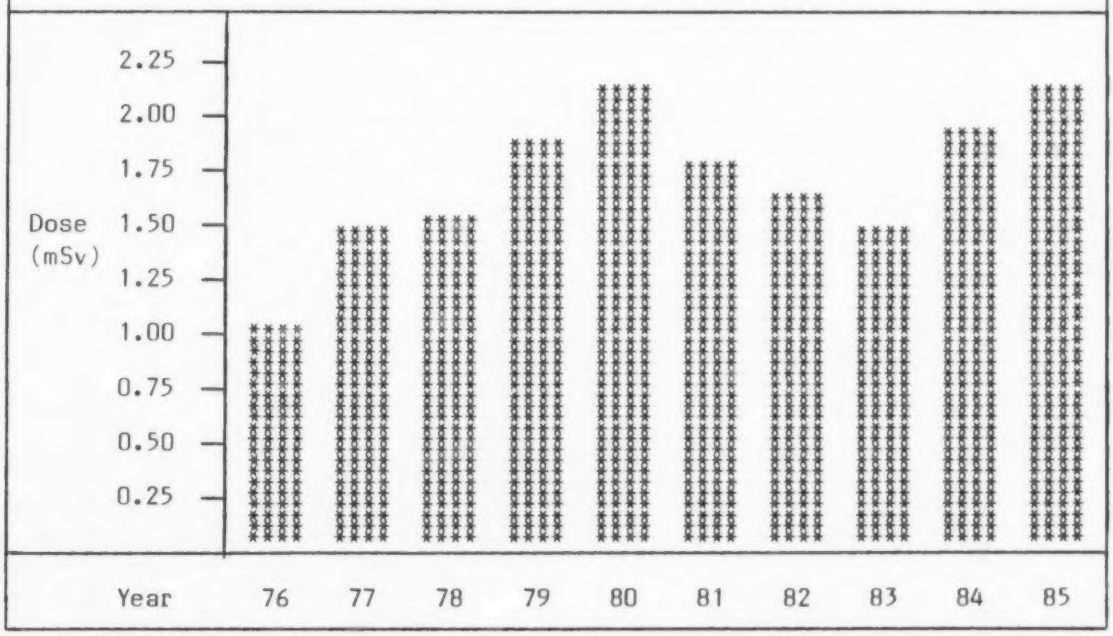


TABLE 4 (Cont'd)

MEDICAL - LABORATORY TECHNICIAN

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.19	0.12
Average Dose (mSv) (Zero doses removed)	0.74	0.88
Average Dose (mSv) (Zero and high doses removed)	0.74	0.88
Ninth Decile Dose (mSv)	5.00	3.80
Relative Frequency of Annual Doses ≥5.00 mSv ($\times 10^{-4}$)	80	40
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	1895
0.20 - 0.49	491
0.50 - 4.99	166
5.00 - 29.9	20
30.0 - 49.9	0
≥ 50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

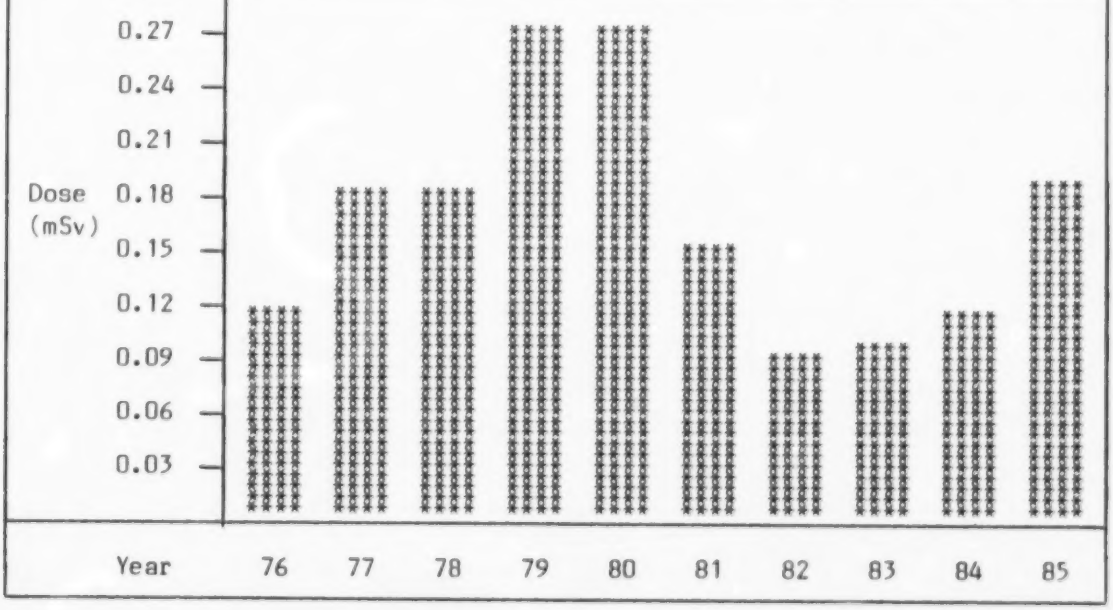


TABLE 4 (Cont'd)

MEDICAL - MEDICAL PHYSICIST

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.53	0.36
Average Dose (mSv) (Zero doses removed)	1.31	1.33
Average Dose (mSv) (Zero and high doses removed)	1.31	1.33
Ninth Decile Dose (mSv)	5.70	4.00
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	280	160
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	107
0.20 - 0.49	38
0.50 - 4.99	29
5.00 - 29.9	5
30.0 - 49.9	0
≥50.0	0

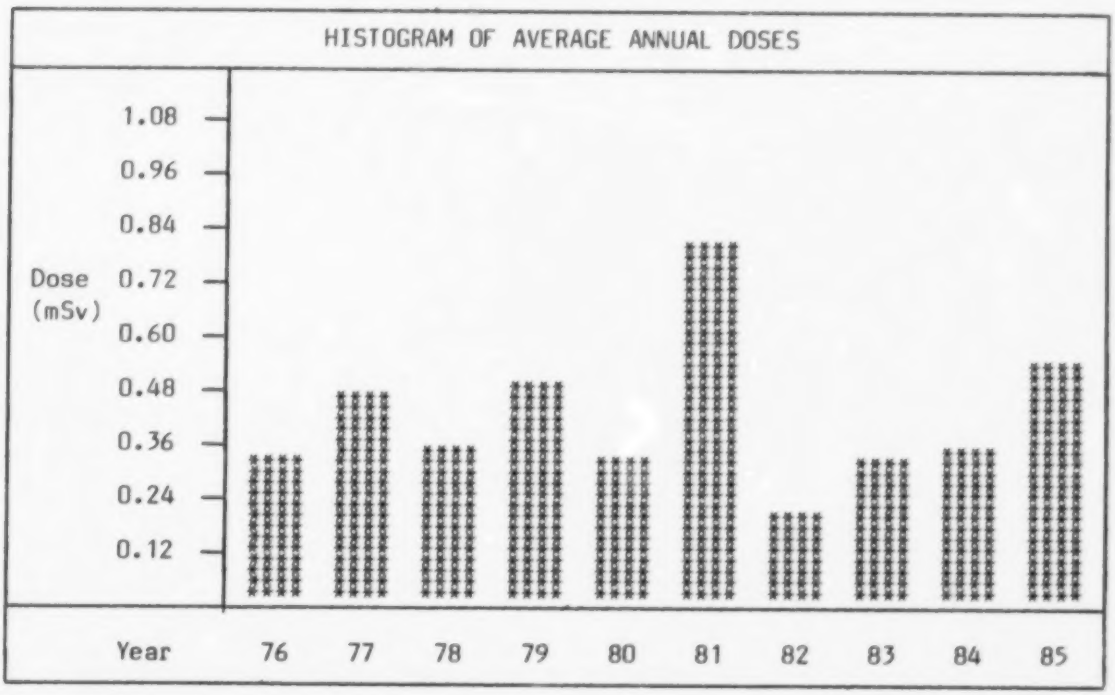


TABLE 4 (Cont'd)

MEDICAL - NURSE

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.19	0.15
Average Dose (mSv) (Zero doses removed)	0.68	0.89
Average Dose (mSv) (Zero and high doses removed)	0.68	0.89
Ninth Decile Dose (mSv)	2.90	2.70
Relative Frequency of Annual Doses ≥5.00 mSv ($\times 10^{-4}$)	30	25
Percentage Contribution to Collective Dose (All doses)	1	1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	2388
0.20 - 0.49	607
0.50 - 4.99	323
5.00 - 29.9	10
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

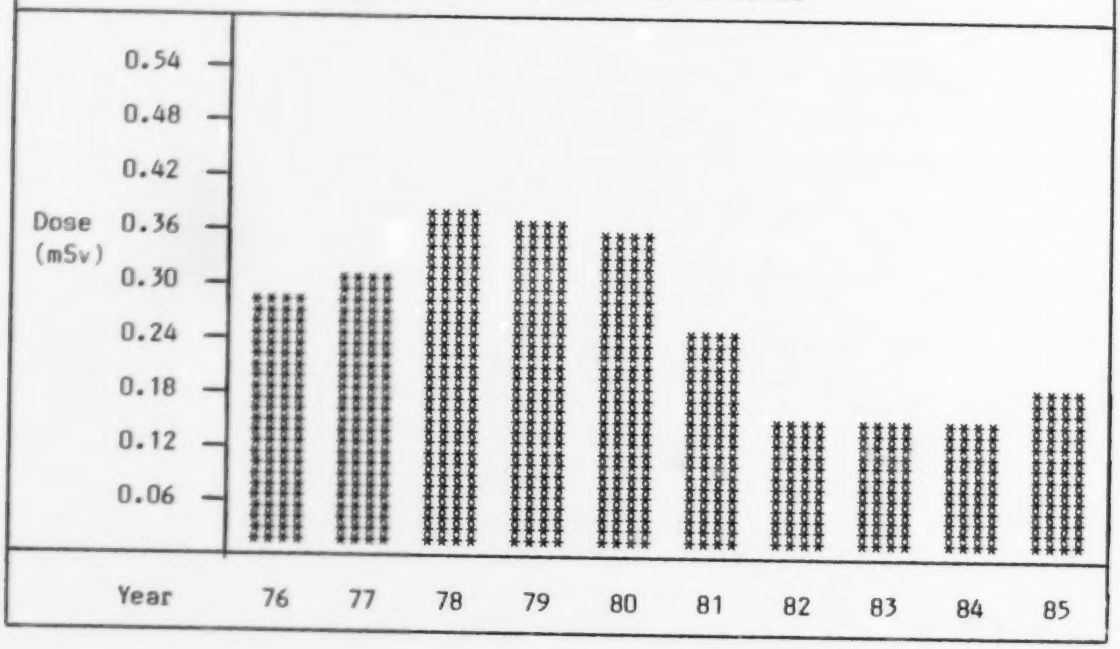


TABLE 4 (Cont'd)

MEDICAL - PHYSICIAN

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.34	0.24
Average Dose (mSv) (Zero doses removed)	0.88	0.99
Average Dose (mSv) (Zero and high doses removed)	0.88	0.99
Ninth Decile Dose (mSv)	3.10	3.70
Relative Frequency of Annual Doses ≥5.00 mSv ($\times 10^{-4}$)	100	60
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	1023
0.20 - 0.49	359
0.50 - 4.99	263
5.00 - 29.9	17
30.0 - 49.9	0
≥50.0	0

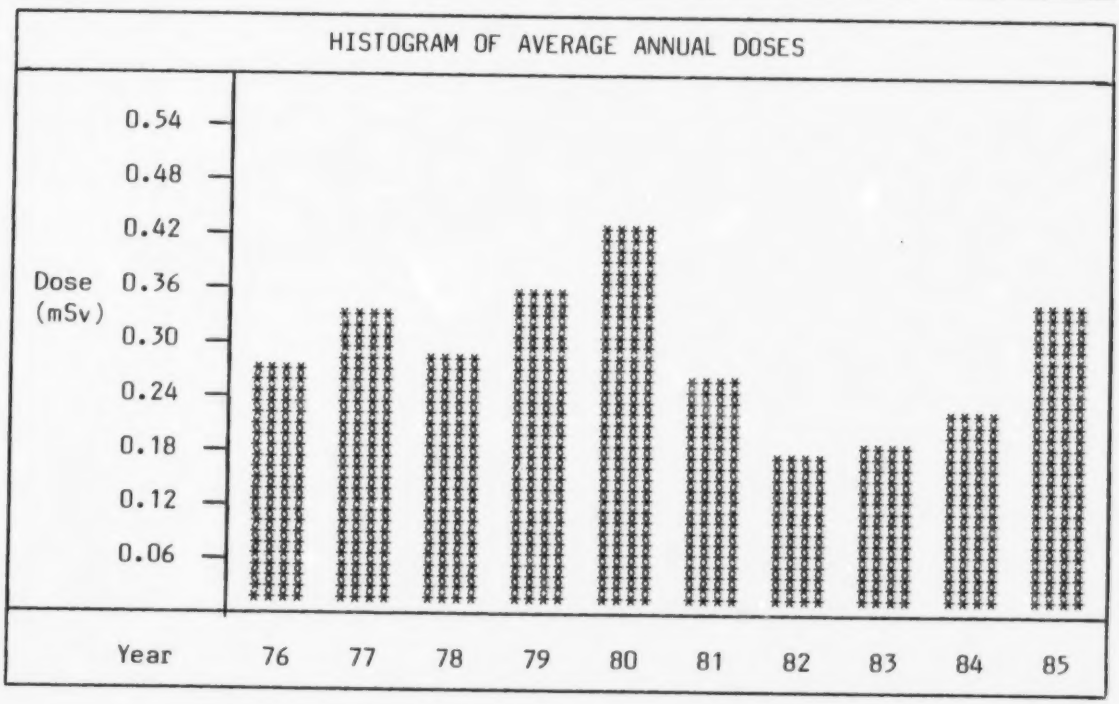


TABLE 4 (Cont'd)

MEDICAL - RADIOLOGICAL TECHNICIAN (DIAGNOSTIC)

TABLE A

DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.17	0.12
Average Dose (mSv) (Zero doses removed)	0.56	0.68
Average Dose (mSv) (Zero and high doses removed)	0.56	0.68
Ninth Decile Dose (mSv)	2.40	3.20
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	30	30
Percentage Contribution to Collective Dose (All doses)	2	1

TABLE B

DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	5849
0.20 - 0.49	1765
0.50 - 4.99	766
5.00 - 29.9	24
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

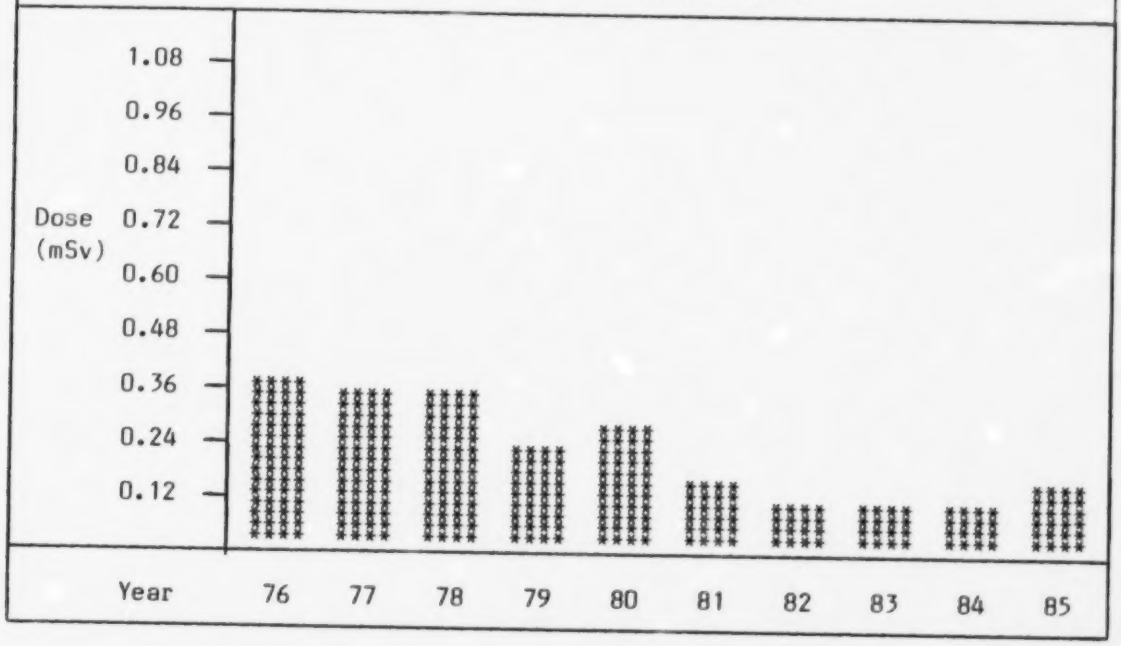


TABLE 4 (Cont'd)

MEDICAL - RADIOLOGICAL TECHNICIAN (THERAPEUTIC)

TABLE A

DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	1.10	1.23
Average Dose (mSv) (Zero doses removed)	1.56	1.81
Average Dose (mSv) (Zero and high doses removed)	1.56	1.81
Ninth Decile Dose (mSv)	3.80	4.80
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	310	500
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B

DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	154
0.20 - 0.49	94
0.50 - 4.99	254
5.00 - 29.9	16
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

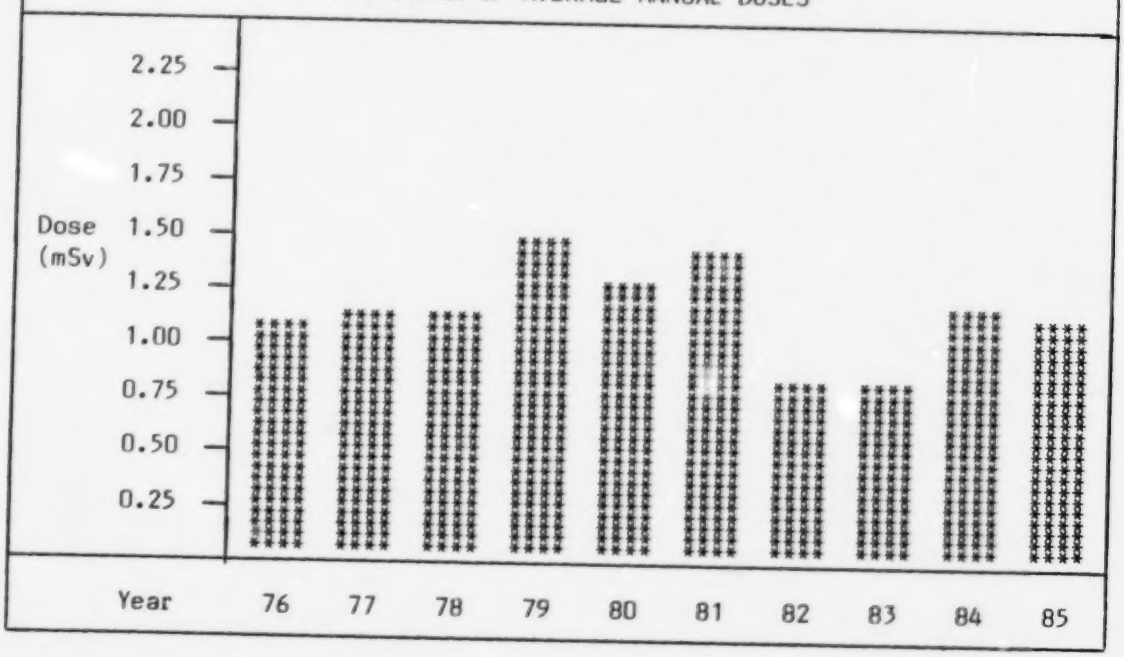


TABLE 4 (Cont'd)

MEDICAL - RADIOLOGIST (DIAGNOSTIC)

TABLE A

DOSE STATISTICS	1985	1984
Average Dose (mSv) All doses)	0.35	0.25
Average Dose (mSv) (Zero doses removed)	0.83	0.94
Average Dose (mSv) (Zero and high doses removed)	0.83	0.94
Ninth Decile Dose (mSv)	3.30	3.60
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	120	80
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B

DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	852
0.20 - 0.49	347
0.50 - 4.99	252
5.00 - 29.9	17
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

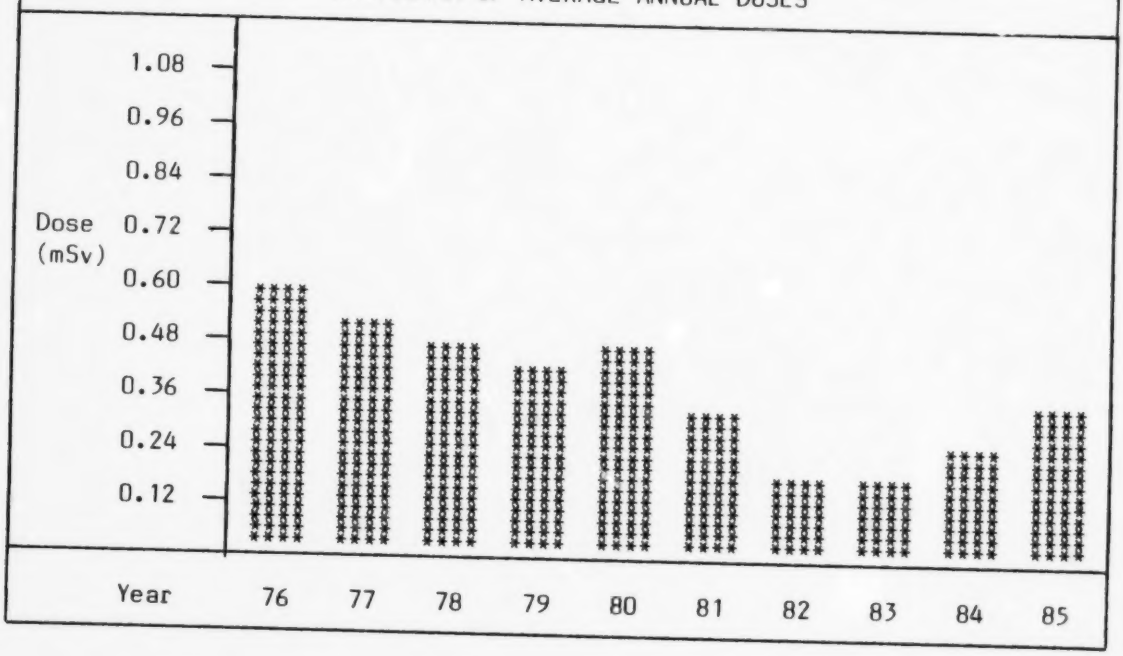


TABLE 4 (Cont'd)

MEDICAL - RADIOLOGIST (THERAPEUTIC)

TABLE A

DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.61	0.41
Average Dose (mSv) (Zero doses removed)	1.03	0.97
Average Dose (mSv) (Zero and high doses removed)	1.03	0.97
Ninth Decile Dose (mSv)	2.80	2.70
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	80	<1
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B

DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	54
0.20 - 0.49	32
0.50 - 4.99	45
5.00 - 29.9	1
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

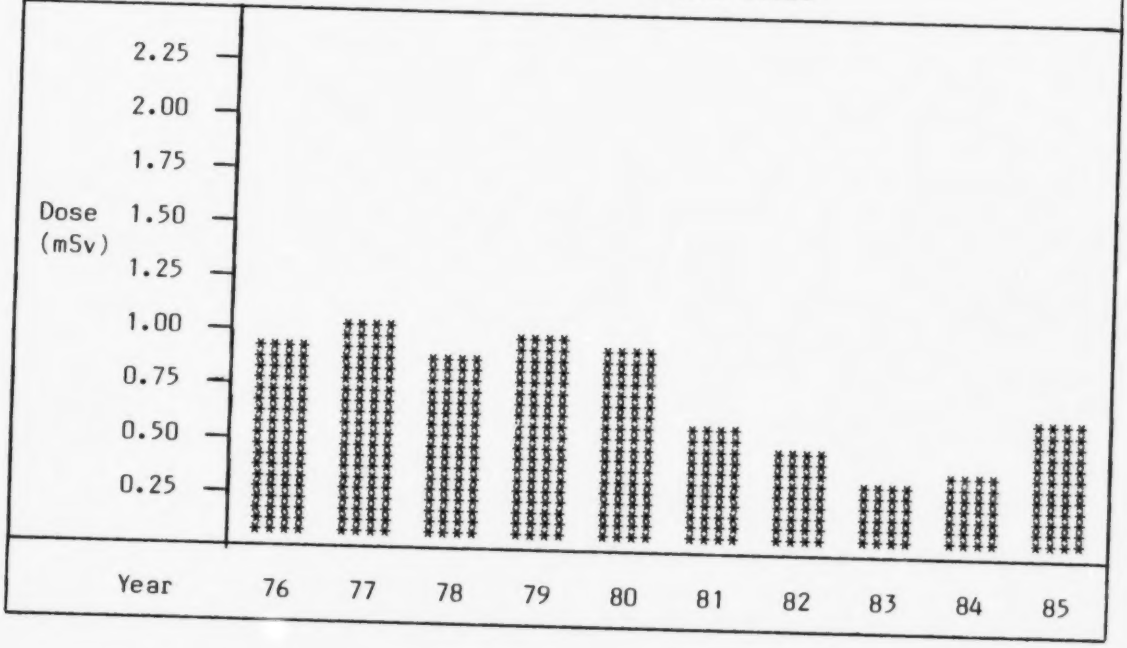


TABLE 4 (Cont'd)

MEDICAL - VETERINARIAN

TABLE A

DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.14	0.10
Average Dose (mSv) (Zero doses removed)	0.56	0.59
Average Dose (mSv) (Zero and high doses removed)	0.56	0.59
Ninth Decile Dose (mSv)	2.40	1.80
Relative Frequency of Annual Doses ≥5.00 mSv ($\times 10^{-4}$)	20	<1
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B

DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	1054
0.20 - 0.49	237
0.50 - 4.99	105
5.00 - 29.9	3
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

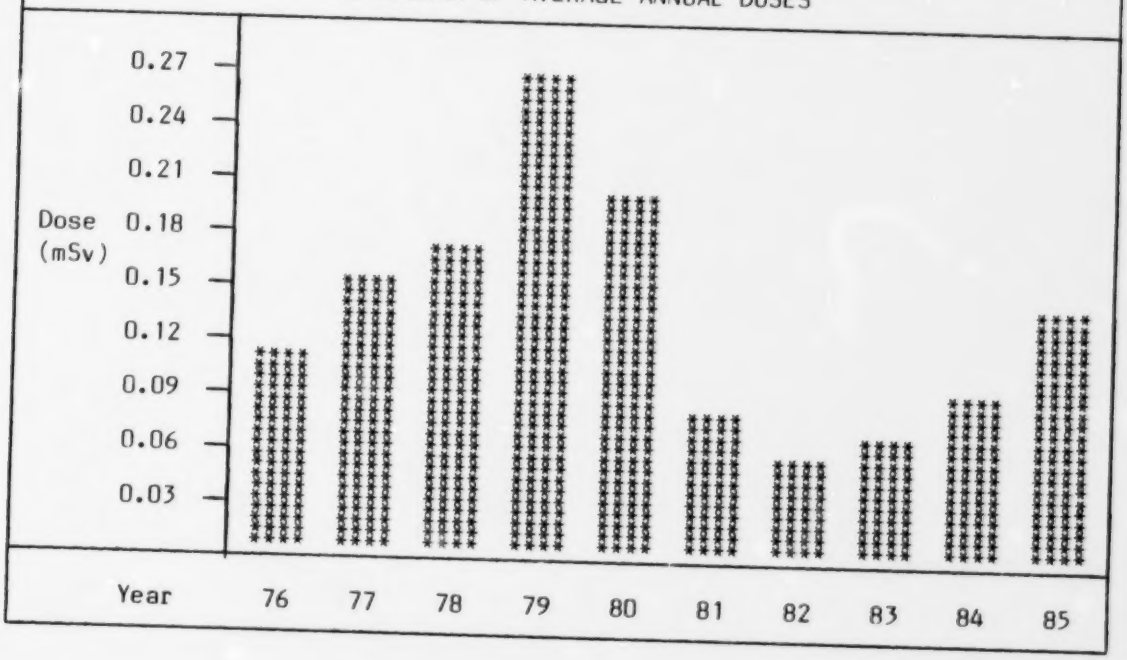


TABLE 4 (Cont'd)

MEDICAL - WARD AID/ORDERLY

TABLE A

DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.13	0.08
Average Dose (mSv) (Zero doses removed)	0.58	0.57
Average Dose (mSv) (Zero and high doses removed)	0.58	0.57
Ninth Decile Dose (mSv)	2.40	2.10
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	15	<1
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B

DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	1013
0.20 - 0.49	193
0.50 - 4.99	96
5.00 - 29.9	2
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

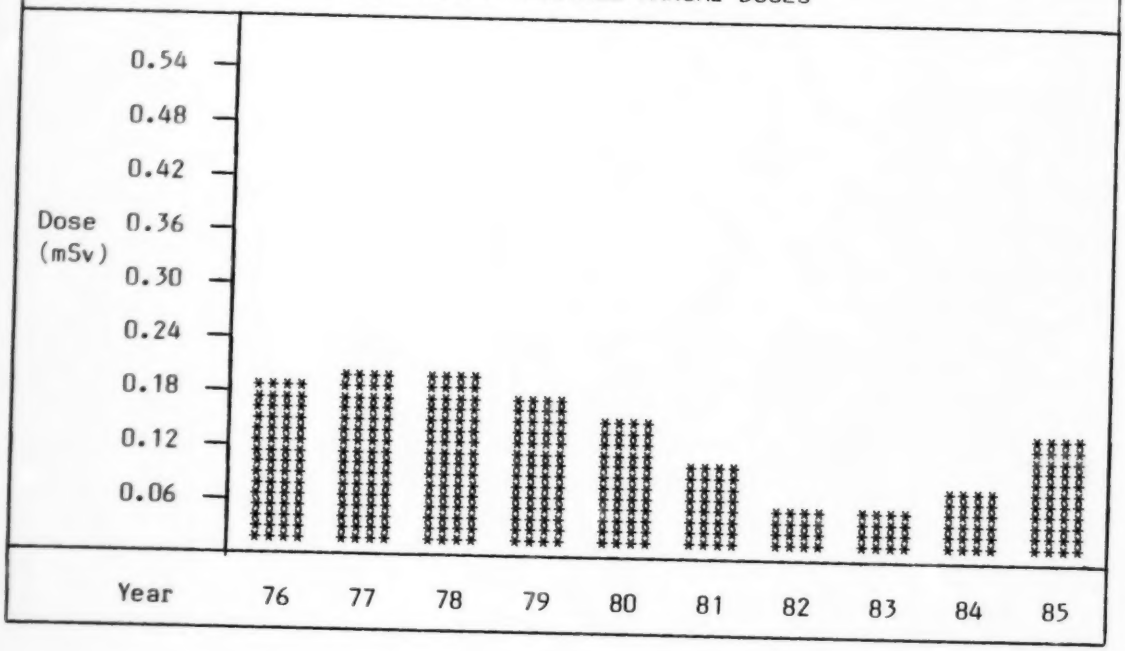


TABLE 4 (Cont'd)

MINE WORKERS - URANIUM MINER (External Gamma Dose)

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	2.13	2.44
Average Dose (mSv) (Zero doses removed)	2.87	3.22
Average Dose (mSv) (Zero and high doses removed)	2.87	3.22
Ninth Decile Dose (mSv)	7.10	8.20
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	1550	1950
Percentage Contribution to Collective Dose (All doses)	21	25

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	1727
0.20 - 0.49	915
0.50 - 4.99	2998
5.00 - 29.9	1017
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

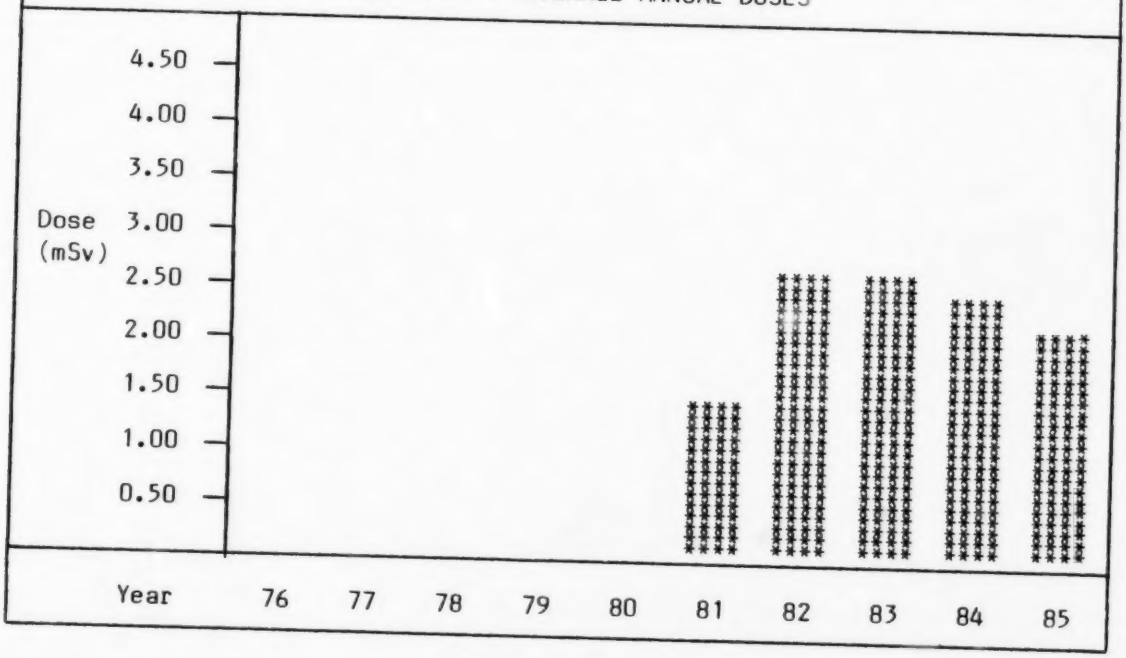
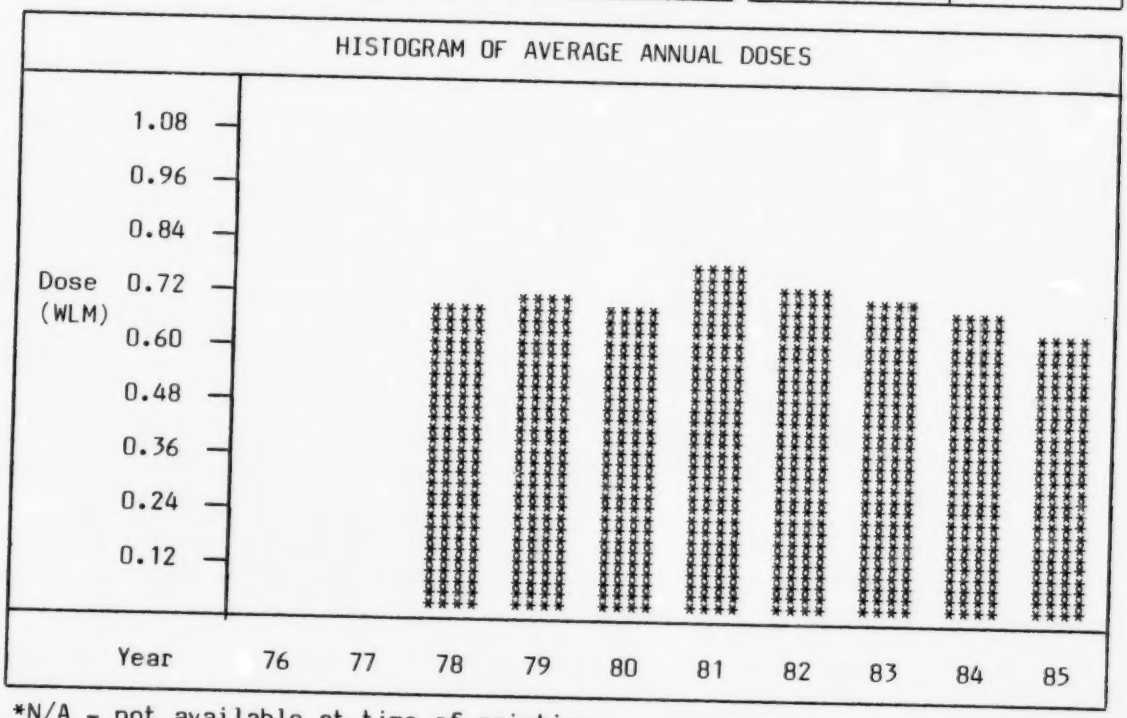


TABLE 4 (Cont'd)

MINE WORKERS - URANIUM MINER (Radon Daughter Exposure)

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (WLM) (All doses)	0.65	0.70
Average Dose (WLM) (Zero doses removed)	1.00	1.07
Average Dose (WLM) (Zero and high doses removed)	1.00	1.07
Ninth Decile Dose (WLM)	N/A*	N/A*

TABLE B	
DOSE RANGE (WLM)	# PERSONS (1985)
0.00 - 0.19	1693
0.20 - 0.99	1928
1.00 - 1.99	944
2.00 - 2.99	226
3.00 - 3.99	38
≥ 4.00	0



*N/A - not available at time of printing

TABLE 4 (Cont'd)

REACTOR - ADMINISTRATOR/SECURITY/JANITOR

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.23	0.29
Average Dose (mSv) (Zero doses removed)	1.15	1.05
Average Dose (mSv) (Zero and high doses removed)	1.15	1.05
Ninth Decile Dose (mSv)	5.20	6.55
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	100	130
Percentage Contribution to Collective Dose (All doses)	1	1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	2736
0.20 - 0.49	423
0.50 - 4.99	248
5.00 - 29.9	32
30.0 - 49.9	0
≥50.0	0

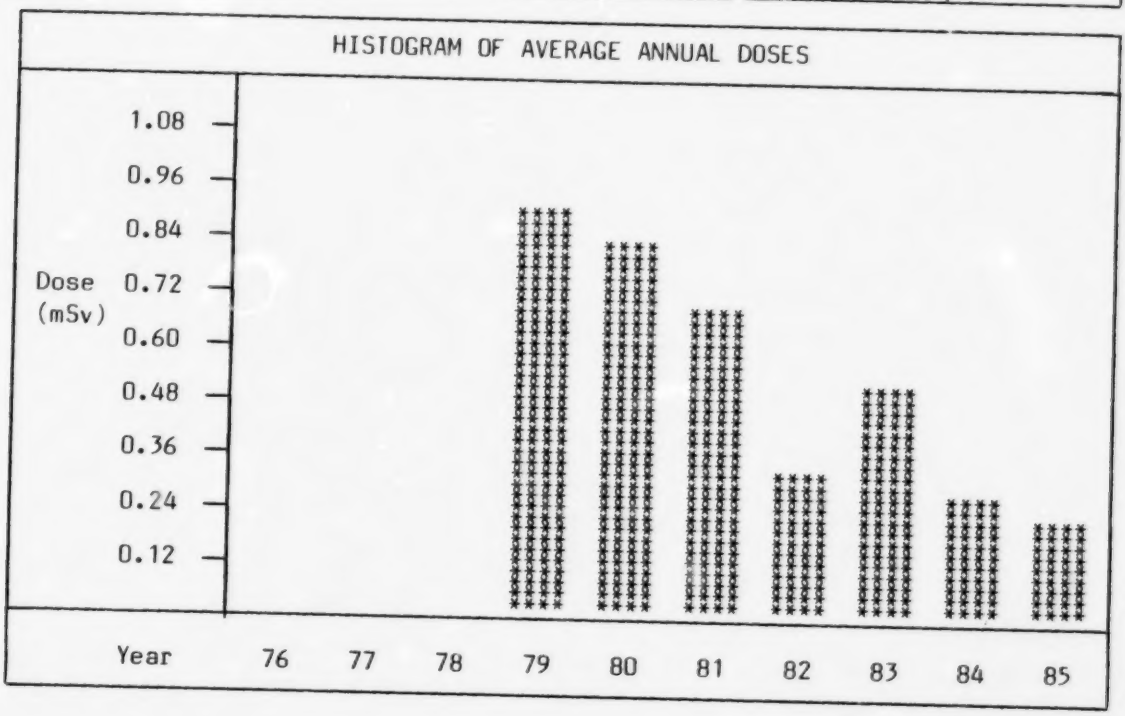


TABLE 4 (Cont'd)

REACTOR - CHEMICAL AND RADIATION CONTROL

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	3.62	3.73
Average Dose (mSv) (Zero doses removed)	5.16	4.74
Average Dose (mSv) (Zero and high doses removed)	4.64	4.04
Ninth Decile Dose (mSv)	14.67	14.68
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	2300	2400
Percentage Contribution to Collective Dose (All doses)	2	3

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	123
0.20 - 0.49	55
0.50 - 4.99	139
5.00 - 29.9	91
30.0 - 49.9	5
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

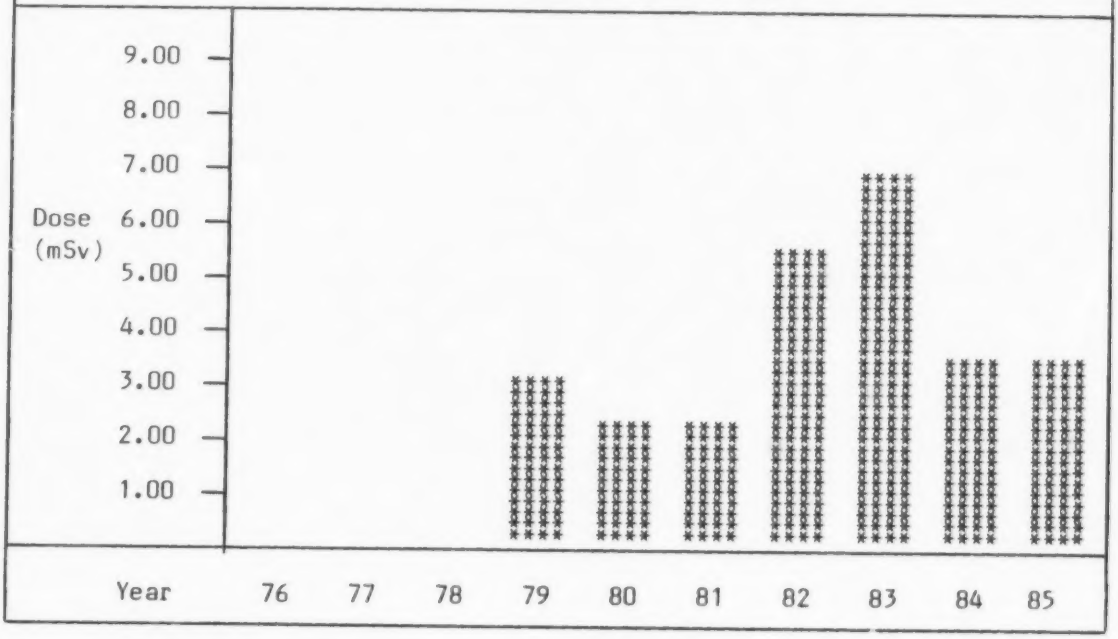


TABLE 4 (Cont'd)

REACTOR - CONSTRUCTION

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.84	1.30
Average Dose (mSv) (Zero doses removed)	2.98	4.33
Average Dose (mSv) (Zero and high doses removed)	2.98	4.27
Ninth Decile Dose (mSv)	9.70	14.05
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	530	890
Percentage Contribution to Collective Dose (All doses)	2	4

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	1430
0.20 - 0.49	164
0.50 - 4.99	288
5.00 - 29.9	106
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

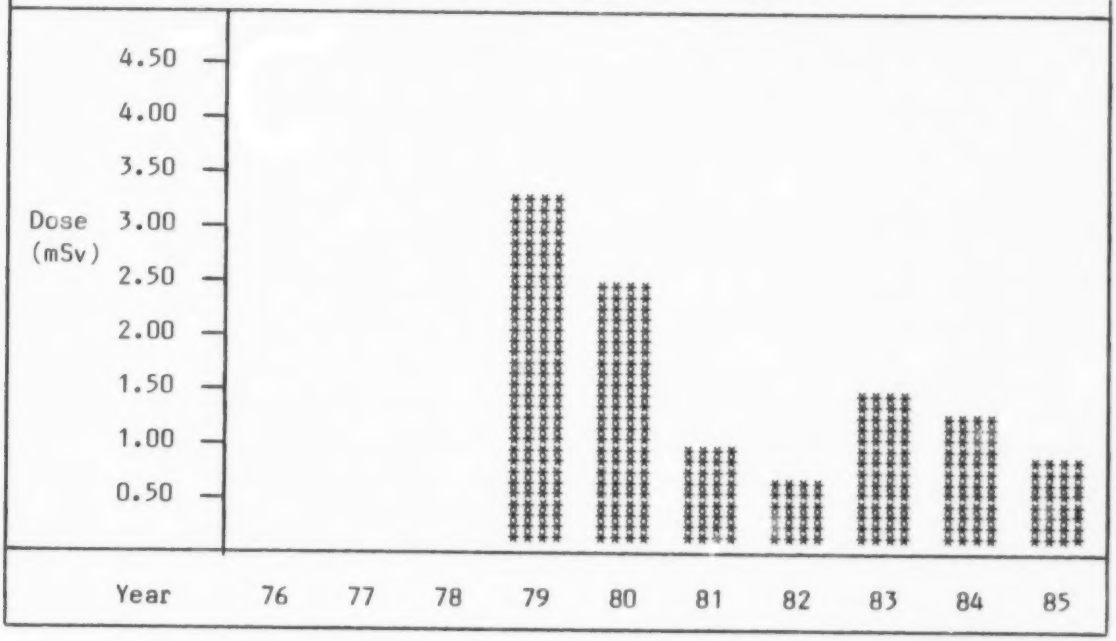


TABLE 4 (Cont'd)

REACTOR - CONTROL TECHNICIAN

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	1.69	2.51
Average Dose (mSv) (Zero doses removed)	3.10	5.00
Average Dose (mSv) (Zero and high doses removed)	3.10	4.83
Ninth Decile Dose (mSv)	8.25	16.00
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	970	1600
Percentage Contribution to Collective Dose (All doses)	2	3

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	365
0.20 - 0.49	82
0.50 - 4.99	278
5.00 - 29.9	77
30.0 - 49.9	1
≥50.0	0

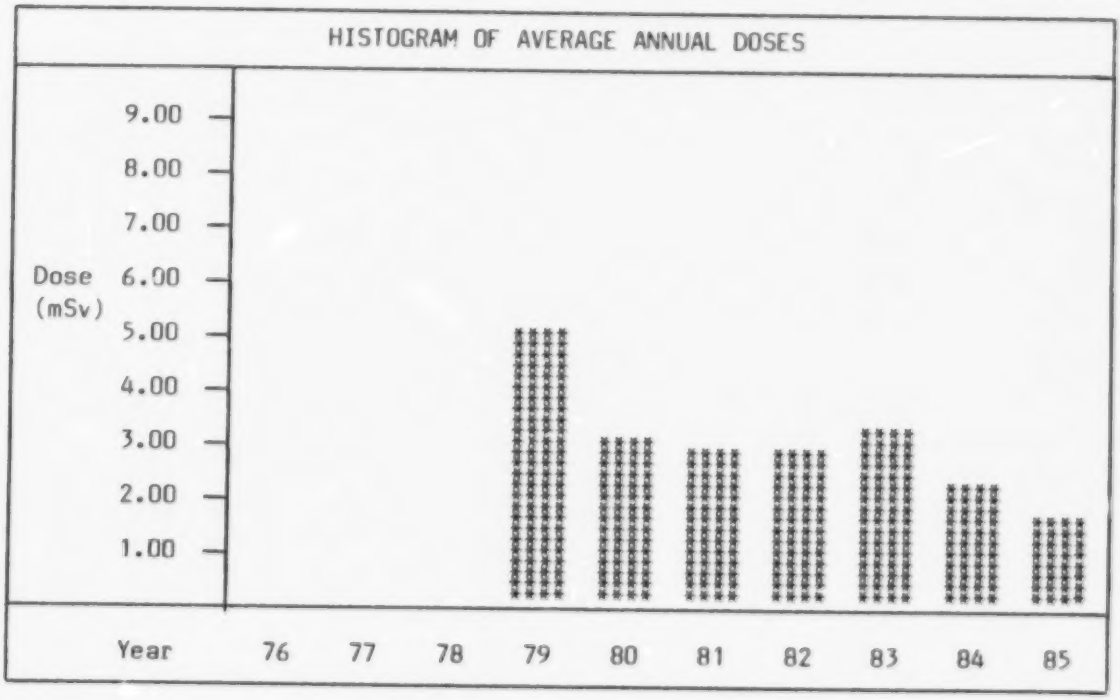


TABLE 4 (Cont'd)

REACTOR - ELECTRICAL MAINTENANCE

TABLE A

DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	1.35	1.62
Average Dose (mSv) (Zero doses removed)	2.16	2.03
Average Dose (mSv) (Zero and high doses removed)	2.16	2.03
Ninth Decile Dose (mSv)	6.15	5.46
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	700	800
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B

DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	99
0.20 - 0.49	53
0.50 - 4.99	95
5.00 - 29.9	19
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

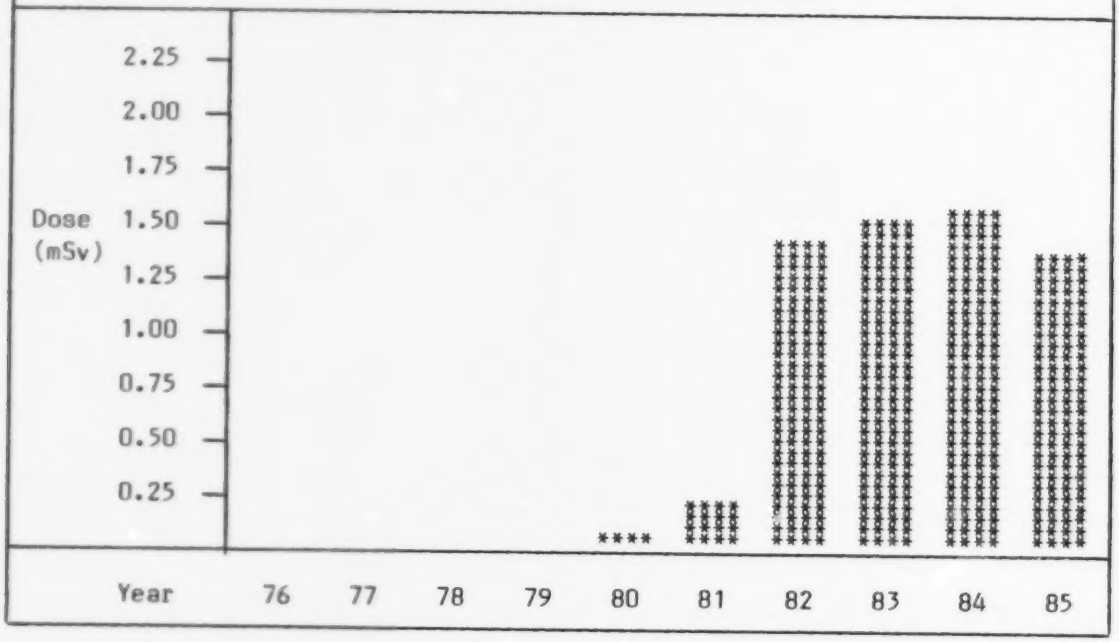


TABLE 4 (Cont'd)

REACTOR - FUEL HANDLING

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	2.20	2.22
Average Dose (mSv) (Zero doses removed)	2.98	2.47
Average Dose (mSv) (Zero and high doses removed)	2.52	2.47
Ninth Decile Dose (mSv)	9.01	7.36
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	1000	1200
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	48
0.20 - 0.49	40
0.50 - 4.99	78
5.00 - 29.9	16
30.0 - 49.9	2
≥50.0	0

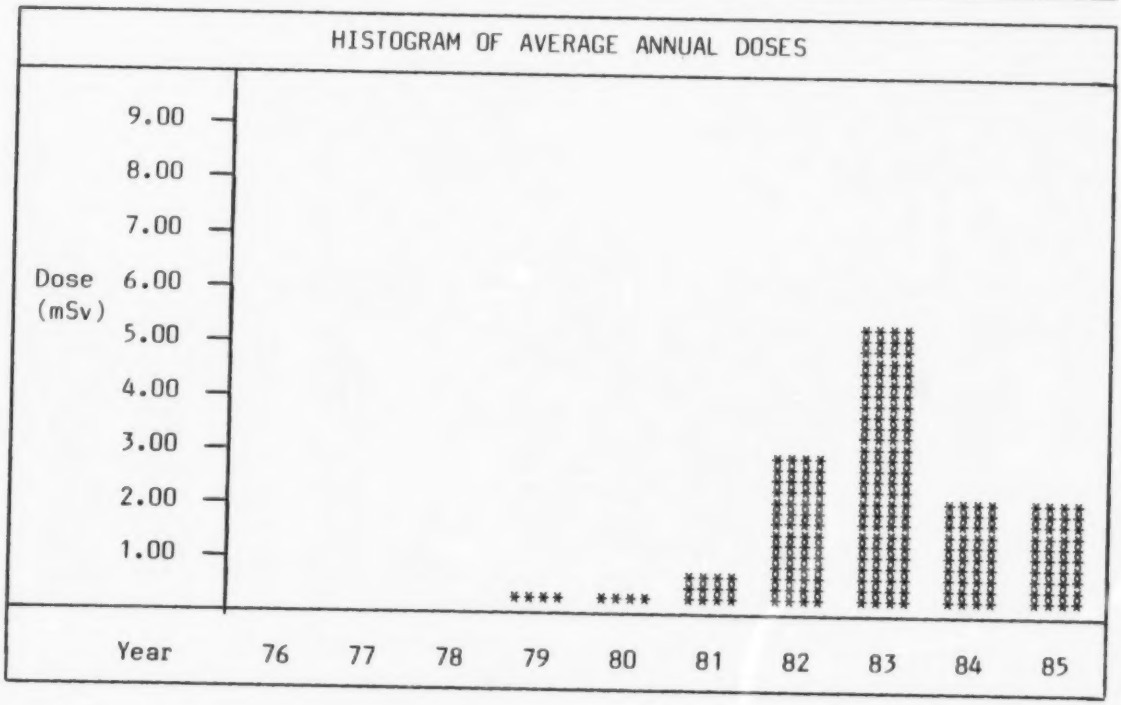


TABLE 4 (Cont'd)

REACTOR - GENERAL MAINTENANCE

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.92	1.17
Average Dose (mSv) (Zero doses removed)	2.06	2.29
Average Dose (mSv) (Zero and high doses removed)	2.06	2.29
Ninth Decile Dose (mSv)	7.63	8.23
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	500	730
Percentage Contribution to Collective Dose (All doses)	12	3

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	899
0.20 - 0.49	259
0.50 - 4.99	389
5.00 - 29.9	80
30.0 - 49.9	0
≥50.0	0

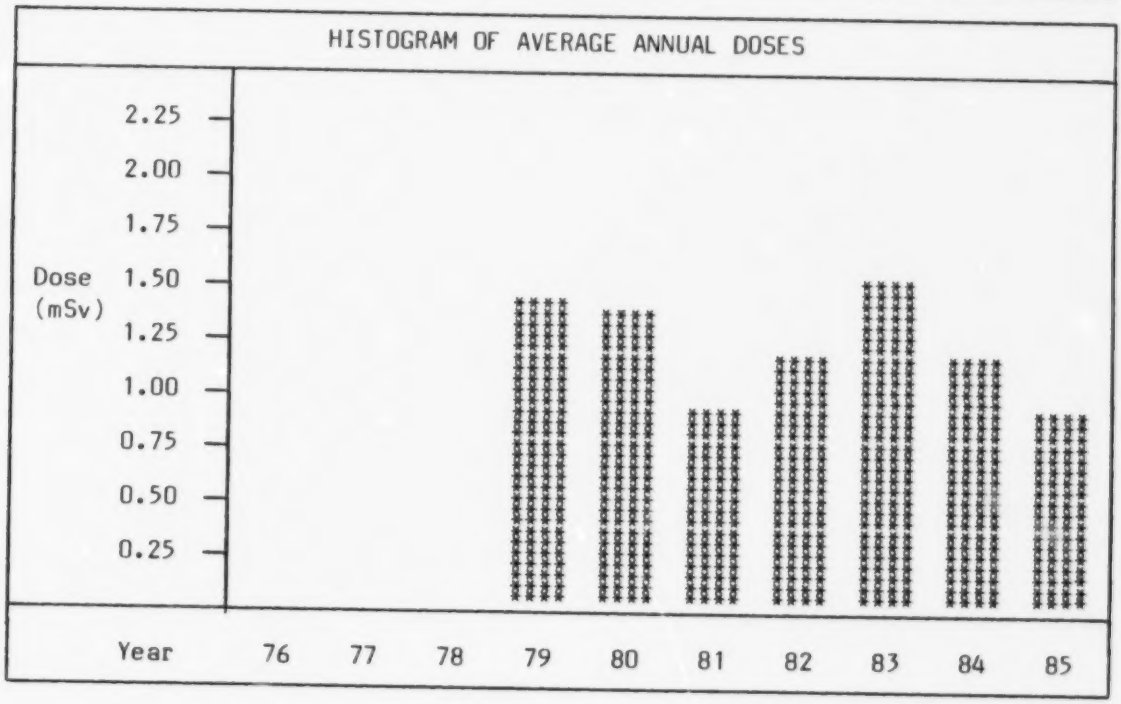


TABLE 4 (Cont'd)

REACTOR - HEALTH PHYSICS

TABLE A

DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	1.11	0.95
Average Dose (mSv) (Zero doses removed)	2.27	1.35
Average Dose (mSv) (Zero and high doses removed)	2.27	1.35
Ninth Decile Dose (mSv)	6.68	4.11
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	650	220
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B

DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	47
0.20 - 0.49	21
0.50 - 4.99	18
5.00 - 29.9	6
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

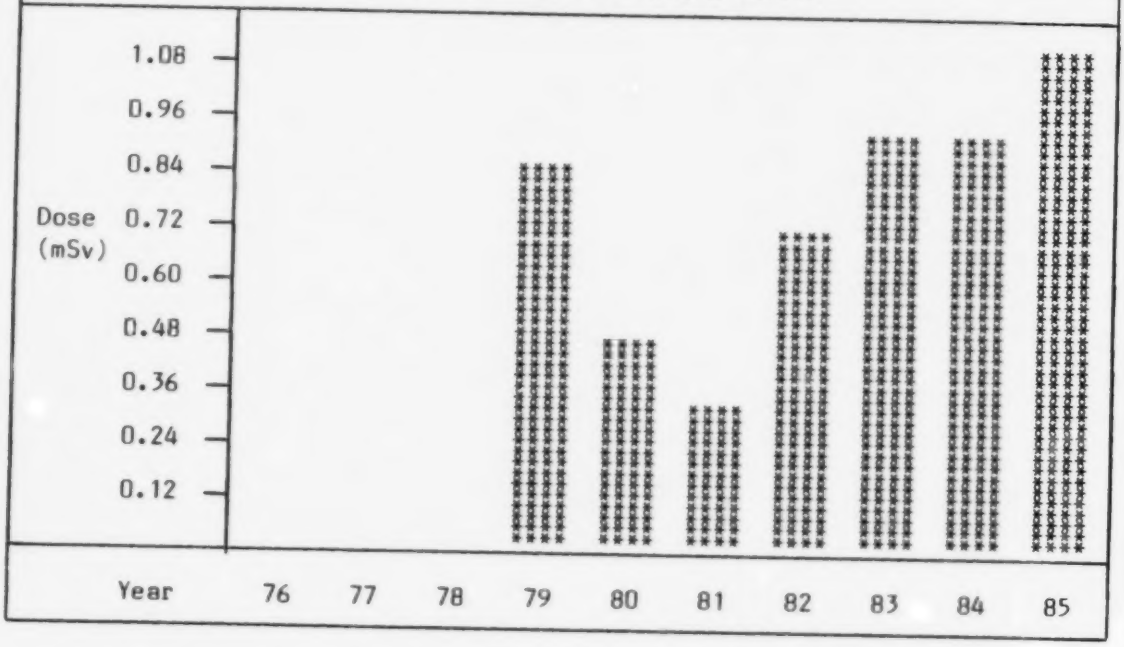


TABLE 4 (Cont'd)

REACTOR - MECHANICAL MAINTENANCE

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	4.64	6.22
Average Dose (mSv) (Zero doses removed)	6.35	8.54
Average Dose (mSv) (Zero and high doses removed)	6.19	7.36
Ninth Decile Dose (mSv)	17.60	26.45
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	3100	3100
Percentage Contribution to Collective Dose (All doses)	9	11

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	334
0.20 - 0.49	139
0.50 - 4.99	377
5.00 - 29.9	385
30.0 - 49.9	5
≥50.0	0

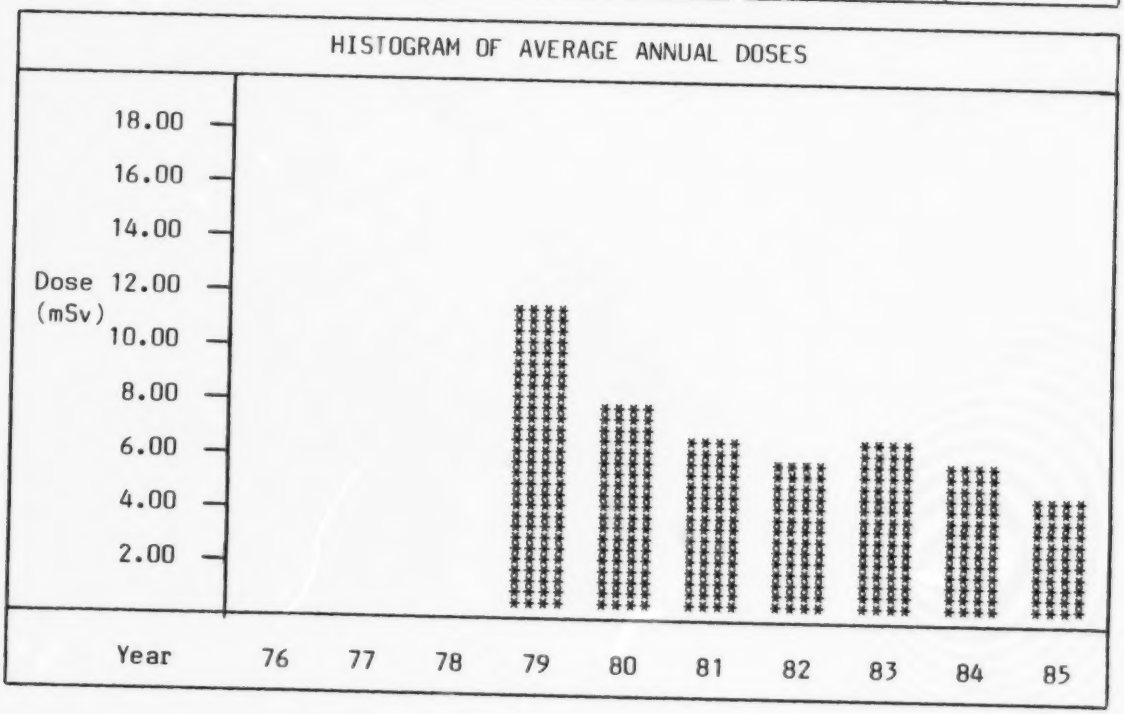


TABLE 4 (Cont'd)

REACTOR - OPERATIONS

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	3.84	4.92
Average Dose (mSv) (Zero doses removed)	5.79	7.04
Average Dose (mSv) (Zero and high doses removed)	5.26	6.37
Ninth Decile Dose (mSv)	15.49	20.15
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	2600	3000
Percentage Contribution to Collective Dose (All doses)	9	12

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	543
0.20 - 0.49	148
0.50 - 4.99	500
5.00 - 29.9	399
30.0 - 49.9	19
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

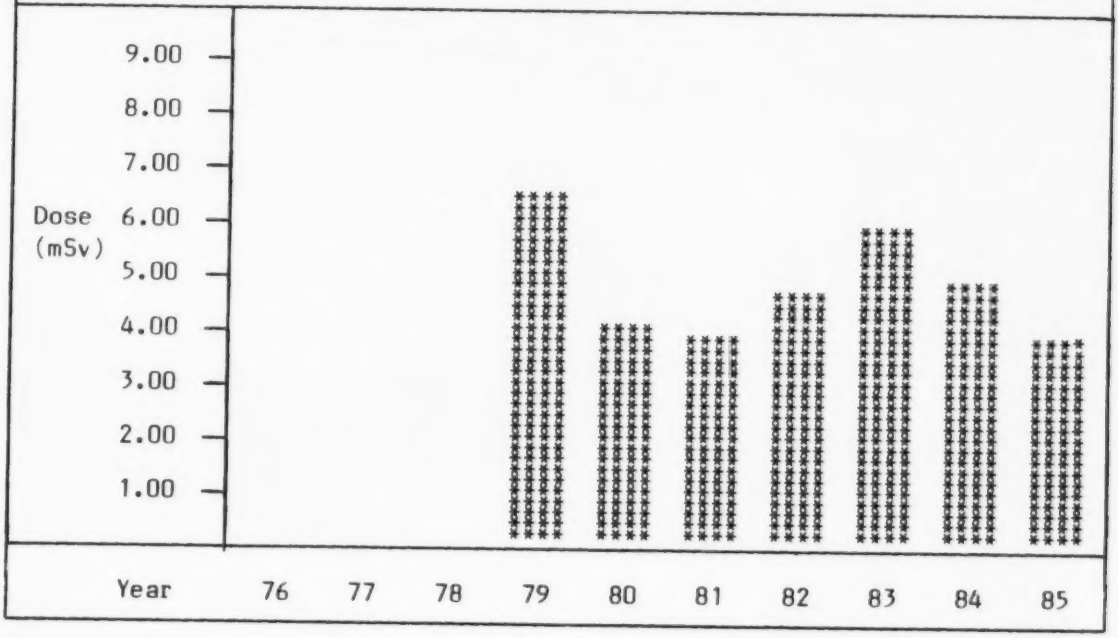


TABLE 4 (Cont'd)

REACTOR - SCIENTIFIC/PROFESSIONAL

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.34	0.53
Average Dose (mSv) (Zero doses removed)	1.21	1.20
Average Dose (mSv) (Zero and high doses removed)	1.16	0.95
Ninth Decile Dose (mSv)	5.45	4.50
Relative Frequency of Annual Doses ≥5.00 mSv ($\times 10^{-4}$)	130	210
Percentage Contribution to Collective Dose (All doses)	1	2

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	1569
0.20 - 0.49	379
0.50 - 4.99	207
5.00 - 29.9	28
30.0 - 49.9	1
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

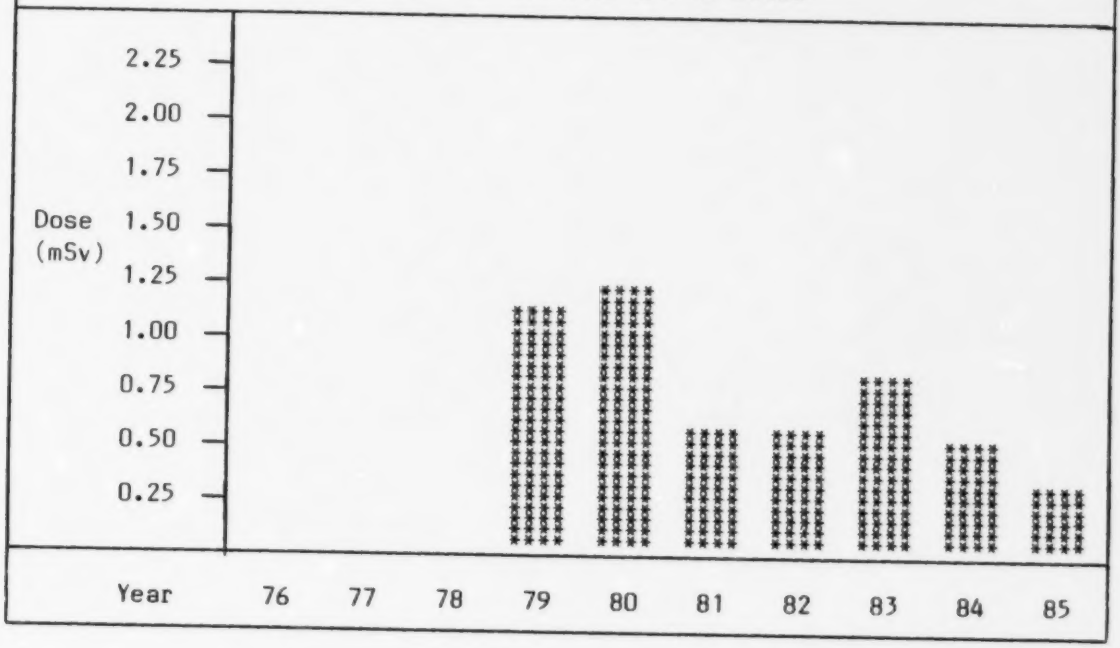


TABLE 4 (Cont'd)

REACTOR - TRAINING

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.27	0.10
Average Dose (mSv) (Zero doses removed)	1.74	0.76
Average Dose (mSv) (Zero and high doses removed)	1.74	0.76
Ninth Decile Dose (mSv)	2.37	1.62
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	260	1
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	33
0.20 - 0.49	4
0.50 - 4.99	1
5.00 - 29.9	1
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

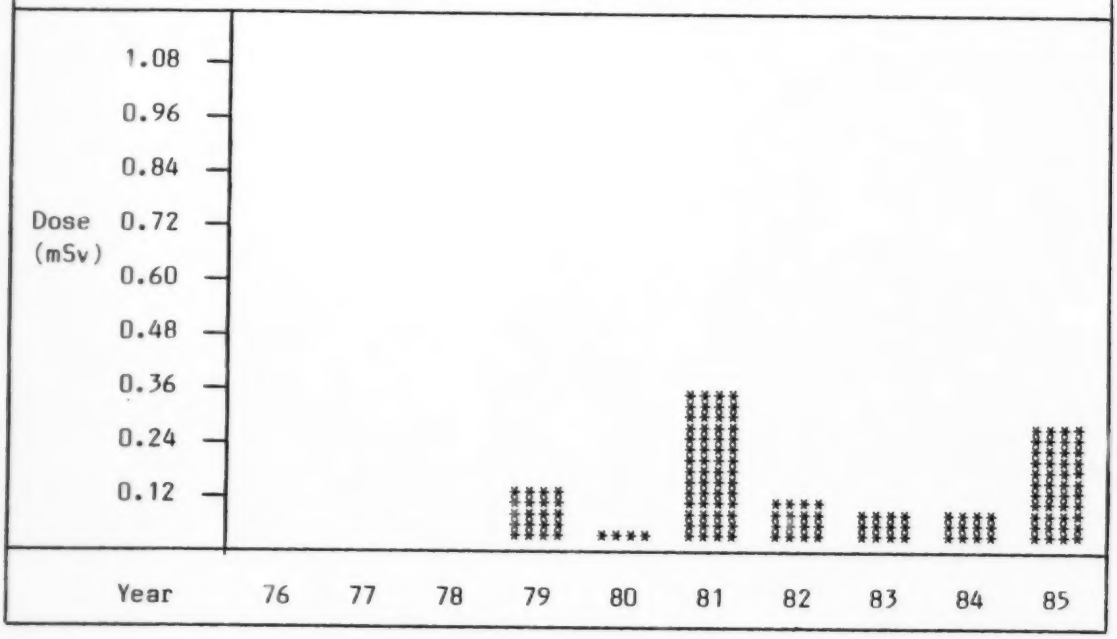


TABLE 4 (Cont'd)

REACTOR - VISITOR

TABLE A		
DOSE STATISTICS	1985	1984
Average Dose (mSv) (All doses)	0.62	0.30
Average Dose (mSv) (Zero doses removed)	0.91	0.56
Average Dose (mSv) (Zero and high doses removed)	0.91	0.56
Ninth Decile Dose (mSv)	1.90	1.28
Relative Frequency of Annual Doses ≥5.00 mSv (x 10^{-4})	170	<1
Percentage Contribution to Collective Dose (All doses)	<1	<1

TABLE B	
DOSE RANGE (mSv)	# PERSONS (1985)
0.00 - 0.19	38
0.20 - 0.49	46
0.50 - 4.99	34
5.00 - 29.9	2
30.0 - 49.9	0
≥50.0	0

HISTOGRAM OF AVERAGE ANNUAL DOSES

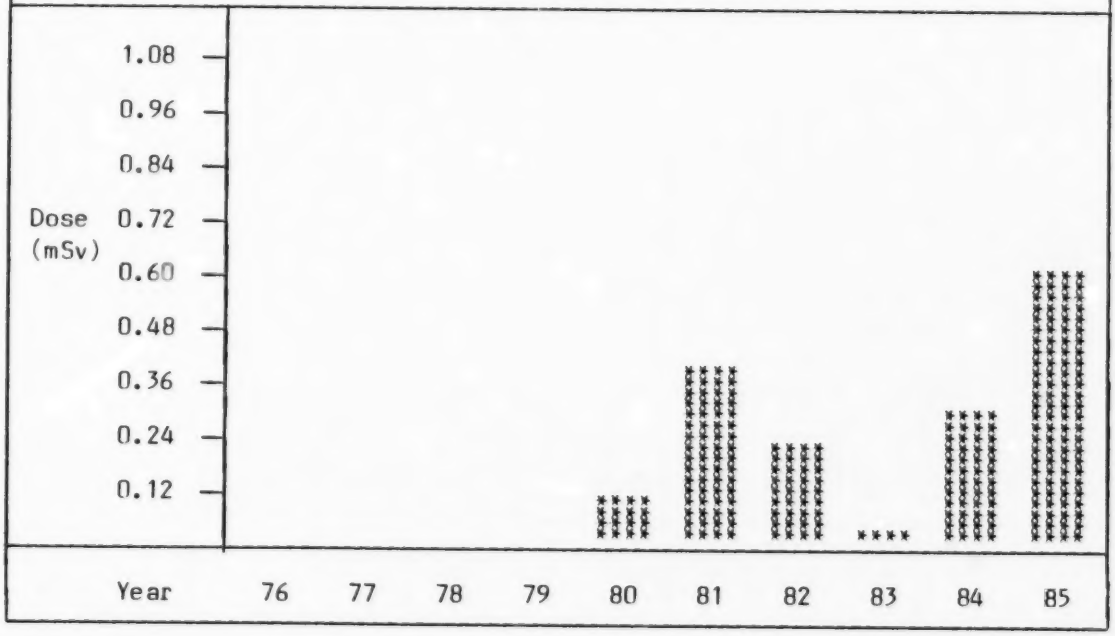


TABLE 5

OVEREXPOSURE SUMMARY 1985

Case No.	Type of Organization	Occupation	Dose Equivalent		Source of Exposure	Result** of Investigation
			mSv	Type*		
7498	Industry	Radiographer	30.00	WB	Iridium-192 Camera	P
7595	Industry	Technician	102.20	HEAD	Radiopharmaceutical	P
7680	Industry	Radiographer	36.60	WB	Iridium-193 Camera	NP
7690	Hospital	Technician	174.00	WB	X-Ray Unit	NP
7776	Industry	Radiographer	32.00	WB	Iridium-192 Camera	P
7803	Hospital	Technician	54.00	WB	X-Ray Unit	P
7815	Industry	Radiographer	600.00	WB	Iridium-192 Camera	NP
7829	College	Technician	35.00	WB	Nuclear Gauge	NP
7874	Industry	Technician	9999.99	WB	Electron Beam	NP
7883	University	Scientist	2286.20	WB	Unknown	NP
7899	Industry	Operator	38.80	WB	UO2 and UF6	P
7924	Dental Clinic	Technician	90.00	WB	X-Ray Unit	NP
7925	Dental Clinic	Technician	41.00	WB	X-Ray Unit	P
7948	Hospital	Technician	85.00	HEAD	Contaminated Syringe Storage	P
7951	Hospital	Technician	900.00	SKIN	Radioactive Contamination	NP

*Dose Equivalent Type
WB - Whole Body
EXT - Extremity

**Result of Investigation
P - Personal
NP - Nonpersonal

TABLE 5 (Cont'd)

Case No.	Type of Organization	Occupation	Dose Equivalent		Source of Exposure	Result of Investigation
			mSv	Type		
7956	Industry	Radiographer	37.00	WB	Iridium-192 Camera	NP
7960	Hospital	Technician	35.00	WB	X-Ray Unit	NP
8000	Industry	Radiographer	35.00	WB	Iridium-192 Camera	NP
8031	Industry	Radiographer	35.00	WB	Iridium-192 Camera	P
8034	Industry	Technician	30.00	WB	Nuclear Gauge	NP
8073	Industry	Radiographer	120.00	WB	Iridium-192 Camera	P
8089	Research	Technician	1800.00	SKIN	X-Ray Unit	P
8115	Industry	Operator	220.00	SKIN	Unknown	NP
8148	Industry	Technician	70.00	WB	X-Ray Unit	NP
8177	Industry	Radiographer	70.00	WB	Iridium-192 Camera	NP
8231	Industry	Technician	520.00	SKIN	X-Ray Unit	NP
8244	Industry	Operator	580.00	WB	X-Ray Unit	NP
			9999.99	SKIN		
8245	Industry	Operator	2800.00	WB	X-Ray Unit	NP
			9999.99	SKIN		
8255	Industry	Operator	160.00	WB	Unknown	NP
8313	University	Scientist	34.00	WB	Cobalt 60 Source	NP
8325	University	Student	9999.99	WB	Unknown	NP
8342	Hospital	Technician	1255.60	WB	X-Ray Unit	NP
8359	Industry	Technician	160.00	WB	X-Ray Unit	NP
8540	Animal Hospital	Technician	60.00	WB	X-Ray Unit	P
8575	Government Department	Technician	81.00	WB	X-Ray Unit	NP
8576	Government Department	Technician	165.00	EXT	X-Ray Unit	NP
8743	Dental Clinic	Dentist	44.00	WB	X-Ray Unit	NP